Prince George TSA inventory audit

Introduction

The Ministry of Forests conducts an inventory of each timber supply area (TSA) in British Columbia every 10 to 30 years (using standards and procedures developed by the Resources Inventory Program). These inventory updates reflect changes in the timber volume due to growth and to depletions from harvesting and natural causes.

This report presents the results of an inventory audit performed within the Prince George TSA, which is located in the north central interior of the province. The TSA covers approximately 7.5 million hectares and is administered by the Prince George, Vanderhoof and Fort St. James Forest Districts.

Purpose of the audit and application of the results

It is often asked, "How accurate is the current inventory?" To answer this important question, the Ministry of Forests has developed an inventory audit methodology specifically designed to test the overall accuracy of estimates of the total standing volume in each timber supply area.

This inventory audit methodology entails sampling three primary components of the inventory: mature forests, immature forests, and non-forest areas.

The objective of the inventory audit program is to help identify TFLs or TSAs where the forest inventory needs attention. Enough samples are taken to ensure statistically reliable results for the TSA as a whole.

The amount of data collected, however, is not sufficient to make statistically reliable conclusions about specific strata within the TSA. For example, any overall differences, highlighted by the audit, could result from problems: with one tree species, from part of the land base (such as high elevation rather than lower elevation areas), from one age group of forest stands, or from a combination of these and other factors. As a consequence, general audit results cannot be used to adjust information for timber harvesting purposes since the audited area represents only a small portion of the total forested area in the TSA.

The audits provide information that may be useful to the Chief Forester when determining the allowable annual cut — offering a general assessment of the uncertainty associated with mature timber volumes, immature site index, and the non-forest classification. However, the audit results cannot justifiably be used to make specific adjustments to growth and yield and other information used in timber supply analyses and allowable annual cut determinations.

Methods

Current inventory

There are 37 TSAs in British Columbia, varying in size from approximately 70 000 hectares to 13 million hectares. Inventories of each TSA are conducted through a multistage process. Polygons are first delineated from 1:15 000-scale aerial photographs. Photo-interpretation is then used to produce data on a number of attributes for each polygon. These attributes include species composition, stand height, age, and crown closure. Timber volume is then estimated indirectly using the photo-interpreted variables and an empirical yield model.

To keep estimates current, inventories are regularly updated to account for forest growth and for depletions due to harvesting, fire, and the impact of insects and disease damage. Empirical yield models, such as the Ministry of Forests Variable Density Yield Prediction (VDYP) computer model, are used to update the inventory for forest growth. Field visitation, satellite imagery, and aerial photographs may be used to update the inventory for depletions.

Inventory audit procedures

The inventory audit tests three components of the current inventory. The first component is the mature forested areas (forest stands older than 60 years). The inventory audit tests the accuracy of the mature timber volume. The second component tested is immature stands (younger than 60 years but older than the silvicultural classification of free growing). The audit tests the accuracy of the site growth potential (site index) assignment for these stands. The third component tested is the area classified as non-forest in the inventory, which includes areas such as lakes, gravel pits, and alpine meadows. The audit tests the accuracy of the photo-interpreted classification for this component.

Mature component assessment criteria

To test the mature component of the inventory, the existing inventory's estimate of the mean mature volume per hectare for the TSA (the inventory volume), is compared with a new estimate of the mean mature volume per hectare obtained from the audit samples (the audit volume).

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The difference between these two estimates is called the total bias. A test is conducted on this bias to determine if it is statistically significant. This test establishes whether there are detectable differences between the audit volume estimate and the inventory volume estimate, for the total forested area of the TSA.

If the total bias is found to be statistically significant, further analyses are conducted to determine if the specific source of bias within the inventory is one of the following:

- *classification bias*: This is caused by incorrectly estimating the polygon attributes; or
- *model bias*: This is caused by poor prediction from the yield model, which was developed for large areas of the province and was not designed for specific management units.

The analysis to determine the source of bias uses an estimate of the mean mature volume per hectare for the TSA called the ground attribute volume. This is calculated from audit sample attributes (stocking class and stand table estimates of species composition and stocking, and ground-based averages of top height and age), along with crown closure taken from the original map label, using the yield prediction model. The difference between the ground attribute volume estimate and the audit volume estimate approximates the bias associated with the yield model. The difference between the audit volume estimate and the inventory volume estimate not accounted for by the model bias approximates the bias associated with the inventory classification attributes. Once the source is identified, further analyses may be done on the inventory classification attributes or the yield model itself.

Immature component assessment criteria

Accuracy of the inventory classification for immature stands is tested by examining the site index assignment. Since the immature forest stand site index provides an estimate of site productivity, its accuracy affects the projection of long-term harvest levels.

Data gathered is examined to determine how closely the audit and inventory site indices match for individual samples, and to explore potential trends.

Non-forest component assessment criteria

The audit test for the non-forest component of the inventory assesses the accuracy of the non-forest classification assignment. An air photo interpreter certified by the Ministry of Forests compares the non-forest inventory classification to a suitably-scaled forest cover aerial photograph. Classification accuracy is rated using a point scoring scheme to determine an overall accuracy percentage. The acceptance criteria for this test is 85% or higher.

Prince George TSA audit sampling

procedures

The sampling design for the Prince George TSA inventory audit for the mature forest component of the inventory was modified from 50 to 130 samples to accommodate the large size of the TSA.

The Prince George TSA sample used updated maps based on an inventory originally conducted between 1975 and 1993. For the mature forested component a list of all polygons identified on the inventory maps was produced and sorted on a number of stand characteristics (site quality, age, and species group). Polygons were systematically selected from this list by a process designed to produce a sample representative of the population.

Up to 4 full-measure prism plots and 5 count plots were established within each of the 130 sample polygons. The plots were located systematically, using a square grid and a random start point. The grid interval varied with polygon size. To reduce sample costs for large or irregular polygons, a portion of the polygon was randomly selected for ground sampling. These polygons were divided into equal sections and a total of about 520 full-measure and 650 count plots were established. Field data collection and compilation followed Ministry of Forests cruising and cruise compilation procedures. The objective was to obtain audit volumes that were comparable (in terms of utilization standards and merchantability definitions) to the inventory volumes produced from the VDYP model.

The VDYP system produces net merchantable volume per hectare defined as stem volume inside bark of all live trees excluding a 10-cm diameter inside-bark top, a 30-cm-high stump, and decay (as estimated from Ministry loss factors). Dead potential and veteran trees are not included in the VDYP estimates. The volume is calculated for a utilization standard defined as all live trees of 12.5+ cm dbh. When considering the audit results, it should be noted that there are some differences between the utilization standards applied in the audit and those used operationally.

The audit volume estimates were then compared to the inventory volume estimates (from VDYP) to test the validity of the current inventory. A paired sample t-test was used to test for significant differences. The precision of the inventory volume estimates—how well each inventory volume estimate corresponds to the audit volume estimate on a sample-by-sample basis—was assessed by measuring the statistical correlation. The data was then post-stratified to detect trends related to the operable and inoperable forested land base distribution of the sampled polygons and to detect trends related to the three forest districts in the TSA.

From the immature forested component, a random sample of 40 polygons was selected for sampling. Up to 9 inventory ground calls were established within each of the 40 sample polygons. The plots were located systematically, using a square grid and a random start point, similar to the mature volume component. A total of about 360 ground calls

were established and data collection followed the standard Ministry of Forests inventory ground call procedures.

To audit the non-forest component, a random sample of 30 non-forest polygons was selected. Standard Ministry of Forests inventory air photo classification techniques were used to compare the 30 non-forest polygon classification assignments to corresponding air photos.

Inventory audit results

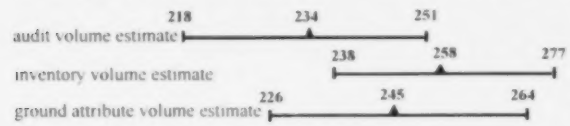
Analysis of mature volumes

Overall results of the inventory audit for mature volume in the total forested area of the Prince George TSA are summarized at the 12.5+ cm dbh utilization limit in Table 1.

TABLE 1. Statistics for the audit volume, inventory volume and ground attribute volume estimates at 12.5+ cm dbh utilization (net decay), Prince George TSA

	Audit vol. estimate	Inventory vol. estimate	Ground attrib. vol. estimate
Number of samples	130	130	130
Mean (m^3/ha)	234	258	245
Coefficient of variation (%)	40	43	45
Standard error	8.2	9.8	9.7
Sampling error (%)	6.9	7.5	7.8
95% confidence interval	218–251	238–277	226–264
Correlation coefficient		r = 0.548	
Ratio of means (audit/inventory):		0.91	

Bar graph representation of 95% confidence intervals (in m^3/ha):



The correlation coefficient of 0.548 for the audit and inventory estimates indicates a good relationship among the individual samples in this stratum. There is a 24 m3/ha difference between the mean inventory estimate for mature volume (258 m3/ha) and the audit estimate (234 m3/ha). This difference is statistically significant 19 times out of 20 for the mature component of the total forested area of the Prince George TSA.

Since there is a statistically significant difference between the two estimates, the ground attribute volume was calculated using the VDYP model. The estimated mean ground attribute volume is 245 m3/ha.

The difference between the mean ground attribute volume (245 m3/ha) and the mean audit volume (234 m3/ha) is 11 m3/ha. The difference between the mean inventory volume (258 m3/ha) and the mean ground attribute volume (245 m3/ha) is 13 m3/ha. This suggests that the model and the classification attributes contribute to the total bias in roughly the same proportions. Although neither the classification bias nor the model bias alone were statistically significant, their cumulative effects result in a significant total bias in the Prince George TSA.

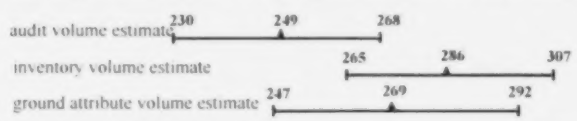
Analysis of operable and inoperable volumes

To provide audit results more likely to be applicable to the timber supply planning process, an approximation was made of the forested areas considered currently available for timber harvesting (operable areas). The audit results were post-stratified based on this approximation. Results of the inventory audit for samples in the operable forested areas in the Prince George TSA are given in Table 2.

TABLE 2. Statistics for the audit volume, inventory volume, and ground attribute volume estimates at 12.5+ cm dbh utilization (net decay), operable forested areas, Prince George TSA

	Audit vol. Estimate	Inventory vol. estimate	Ground attrib. vol. estimate
Number of samples	98	98	98
Mean (m3/ha)	249	286	269
Coefficient of variation (%)	38	36	41
Standard error	9.5	10.5	11.2
Sampling error (%)	7.6	7.3	8.3
95% confidence interval	230–268	265–307	247–292
Correlation coefficient		r = 0.503	
Ratio of means (audit/inventory):		0.87	

Bar graph representation of 95% confidence intervals (in m^3/ha):



For the 98 samples located within the operable forested area, the mean audit volume is 249 m3/ha and mean inventory volume is 286 m3/ha. The difference of 37 m3/ha between the two estimates is statistically significant 19 times out of 20.

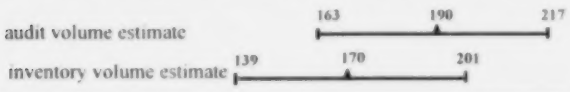
The ground attribute volume for the operable samples was calculated from the VDYP model to determine the source of the bias. The estimate of mean ground attribute volume was 269 m3/ha, which suggests that the VDYP model and the inventory classification attributes contribute in roughly the same proportion to the total bias.

There were 32 audit samples that were located within the inoperable (i.e. not currently available for timber harvesting) forested area. The results of the statistical analysis of the audit for the inoperable forested area are presented in Table 3.

TABLE 3. Statistics for the audit volume, inventory volume, and ground attribute volume estimates at 12.5+ cm dbh utilization (net decay), inoperable forested areas, Prince George TSA

	Audit volume estimate	Inventory volume estimate
Number of samples	32	32
Mean (m3/ha)	190	170
Coefficient of variation (%)	40	51
Standard error	13.4	15.2
Sampling error (%)	14.4	18.2
95% confidence interval	163-217	139-201
Correlation coefficient	r = 0.455	
Ratio of means (audit/inventory):	1.12	

Bar graph representation of 95% confidence intervals (in m^3/ha):



For the 32 samples located within the inoperable forested area, the mean audit volume is 190 m3/ha and mean inventory volume is 170 m3/ha. The difference between these two estimates was not statistically significant.

Analysis of mature volumes by Forest District

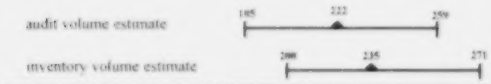
The Prince George TSA is diverse in its topography and forest cover. To provide a more specific indication of the quality of in the inventory across the TSA, the audit results were post-stratified by forest district. In the Vanderhoof and the Fort St. James forest districts, no significant differences between the audit and inventory estimates of mean volume were detected. However, a significant difference between the audit and inventory estimates of mean volume was observed in the Prince George forest district. Details of these findings are provided below.

Table 4 illustrates the audit results for Vanderhoof forest district.

TABLE 4. Statistics for the audit volume and inventory volume estimates at 12.5+ cm dbh utilization (net decay), total forested area, Vanderhoof forest district within the Prince George TSA

	Audit vol. Estimate	Inventory vol. Estimate
Number of samples	31	31
Mean (m3/ha)	222	235
Coefficient of variation (%)	45	41
Standard error	18.1	17.2
Sampling error (%)	16.7	14.9
95% confidence interval	185-259	200-271
Correlation coefficient		r = 0.606
Ratio of means (audit/inventory)		0.94

Bar graph representation of 95% confidence intervals (in m^3/ha):



There were 31 audit samples in the Prince George TSA that were located in the Vanderhoof forest district. The correlation coefficient of 0.606 for the audit and inventory estimates indicates a good relationship among individual samples. There is a 13 m^3/ha difference between the mean inventory estimate for mature volume (235 m^3/ha) and the audit estimate (222 m^3/ha). A paired sample t-test did not detect a statistically significant difference between the inventory and the audit volume estimates for the mature component of the total forest area of Vanderhoof forest district.

Since there is no statistical difference between the two estimates, the ground attribute volume was not calculated.

Table 5 illustrates the audit results for Fort St. James forest district.

TABLE 5. Statistics for the audit volume and inventory volume estimates at 12.5+ cm dbh utilization (net decay), total forested area, Fort St. James forest district within the Prince George TSA

	Audit vol. Estimate	Inventory vol. Estimate
Number of samples	48	48
Mean (m3/ha)	236	226
Coefficient of variation (%)	36	51
Standard error	12.3	16.7
Sampling error (%)	10.4	14.9
95% confidence interval	212-261	193-260
Correlation coefficient		r = 0.625
Ratio of means (audit/inventory):		1.04

Bar graph representation of 95% confidence intervals (in m^3/ha):

There were 48 audit samples that were located in the Fort St. James forest district within Prince George TSA. The correlation coefficient of 0.625 for the audit and inventory estimates indicates a good relationship among individual samples. There is a 10 m^3/ha difference between the mean inventory estimate for mature volume (226 m^3/ha) and the audit estimate (236 m^3/ha). A paired sample t-test did not detect a statistically significant difference between the inventory and the audit volume estimates for the mature component of the total forest area of Fort St. James forest district.

Since there is no statistical difference between the two

estimates, the ground attribute volume was not calculated.

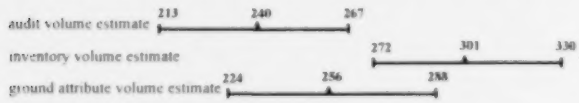
The results of the audit for the Prince George forest district are presented in Table 6.

TABLE 6. Statistics for the audit volume, inventory volume, and ground attribute volume estimates at 12.5+ cm dbh utilization (net decay), total forested area, Prince George forest district within the Prince George TSA

	Audit vol. Estimate	Inventory vol. Estimate	Ground attrib. vol. Estimate
Number of samples	51	51	51
Mean (m3/ha)	240	301	256
Coefficient of variation (%)	40	34	44
Standard error	13.6	14.4	15.8
Sampling error (%)	11.4	9.7	12.4
95% confidence interval	213-267	272-330	224-288

Correlation coefficient r = 0.502
Ratio of means (audit/inventory): 0.80

Bar graph representation of 95% confidence intervals (in m^3/ha):



The correlation coefficient of 0.502 for the audit and inventory estimates indicates a good relationship among the individual samples. There is a 61 m3/ha difference between the mean inventory estimate for mature volume (301 m3/ha) and the audit estimate (240 m3/ha). This difference is statistically significant 19 times out of 20 for the mature component of the total forested area of the Prince George forest district.

Since there is a statistically significant difference between the audit and the inventory volume estimates, the ground attribute volume was calculated using the VDYP model. The estimated mean ground attribute volume is 256 m3/ha. This suggests that, in the Prince George forest district, the majority of the total bias is associated with the classification attributes. These same trends were also observed in the operable portion of the Prince George forest district.

Further post-stratification of the audit data in this forest district by species type suggested that the inventory bias was most clearly associated with spruce stands. Inventory heights for spruce stands were significantly overestimated when compared with the audit heights.

Analysis of immature inventory classification

Out of 40 stands sampled in the field, the inventory correctly identified site index within ±3 m of the audit site index for 20 stands. The inventory site index was more than 3 m lower than the audit site index for 13 stands, and more than 3 m higher for 7 stands.

Analysis of non-forest inventory classification

Twenty-eight stands classified as non-forest were assessed for accuracy of the inventory. The resulting score was 80.8%, which does not meet the provincial minimum standard of 85%.

Discussion and conclusions

The objective of the inventory audit in the Prince George TSA was to assess the overall accuracy of the current (1975 to 1993) Ministry of Forests inventory. The mature, immature, and non-forest components were tested.

Audit results for the mature component of the inventory for the Prince George TSA suggest that the inventory may overestimate volume. When the data was post-stratified, a similar bias was observed in the operable forested area.

Post-stratification of the audit data by forest district suggested that the overestimation bias was associated primarily with the Prince George forest district. In particular, analysis indicated a significant height overestimation by the inventory in spruce stands in the Prince George forest district. Further analysis of this issue is currently being undertaken.

Audit results for the immature component of the inventory suggest an acceptable level of accuracy for site index assignment in young stands.

The audit assessment of the non-forest classification in this TSA indicates that it did not meet provincial standards. This is largely the result of incorrect delineation between brush and swamp. -Results indicate that the issue of non-forest classification accuracy in this TSA had no impact on the forest area available for timber harvesting reported in the timber supply analysis. Deficiencies in the non-forest classification will be addressed in the new vegetation inventory.

Glossary

accuracy: A measure of how close an estimate is to the true value.

allowable annual cut: The rate of timber harvesting specified for an area of land.

analysis unit: The basic building blocks around which inventory data and other information are organized for use in forest planning models, typically involving specific tree species or type groups that are further defined by site class, geographic location or similarity of management regimes.

bias: The quality of a measurement device or procedures that tends to result in a systematic misrepresentation of what is being measured.

coefficient of variation: A relative measure of variation within a population, calculated as the ratio between the standard deviation and the mean value.

confidence interval: The range of values within which the population parameter is expected to lie.

confidence level: The estimated probability that a population parameter lies within a given confidence interval.

correlation coefficient: A measure of the relationship between two variables. A value of 0 for the correlation coefficient indicates a random relationship, whereas a value of ±1 indicates a perfect positive or negative linear correspondence.

dead potential trees: Standing or down dead timber which is estimated to contain at least 50% of its original gross volume in sound wood.

diameter at breast height (dbh): The stem diameter (outside-bark) of a tree measured at breast height (1.3 metres above the point of germination) to the nearest millimetre.

field visitations: Ground-level field procedures designed to provide physical verification of polygon inventory attributes.

free-growing (crop): A crop of healthy trees of a commercially valuable species, the growth of which is not impeded by competition from plants, shrubs, or other trees.

inoperable lands: Lands that are unsuited for timber production now and in the foreseeable future because of their topography, inaccessible location, low value of timber stands, or designation for uses incompatible with timber production.

mean: The average value of a set of observations.

polygon: A portion of land area, delineated on mid-scale aerial photographs, of "like" or uniform land cover type.

pre-inventory assessments: Inventory activities to evaluate the existing forest inventory as a basis for deciding whether to re-inventory or update the current inventory, and to document the existing inventory, maps, and photos to support the execution of the reinventory or update if required.

public sustained yield units (PSYU): A portion of a TSA; an area of Crown land, usually a natural topographic unit determined by drainage areas, managed for sustained yield by the Crown through the Ministry of Forests. It includes all Crown lands within the currently established boundaries of the unit and excludes federal lands, provincial parks, experimental forest reserves, gazetted watersheds and tree farm licenses.

ratio estimate: The ratio between two different estimates.

representative: The quality of a sample having the same characteristics as the population from which it is selected.

sampling: The process of selecting observations.

sampling error: The error attributed to sampling procedures.

significant difference: The results of a statistical test comparing either two or more estimates, or an estimate to a fixed value. If the difference is too large to be attributed to chance, the difference is said to be statistically significant.

site index: An expression of the forest site quality of a stand, at a specified age, based either on the site height, or on the top height, which is a more objective measure.

standard error: An expression of the absolute variability of an estimate.

standard deviation: A measure of the variation of the population.

timber supply analysis: An assessment of future timber supplies over long planning horizons (more than 200 years) by using timber supply models for different scenarios identified in the planning process.

timber supply area (TSA): An area defined by an established pattern of wood flow from management units to the primary timber-using industries.

tree farm license (TFL): Privately managed Sustained Yield Units; designed to enable owners of Crown-granted forest lands and old temporary tenures or the timber licenses which replace them, to combine these with enough unencumbered Crown land to form self-contained sustained yield management units.

variable density yield prediction (VDYP) model: An empirical yield-prediction system for natural stands based on data collected in temporary inventory sample plots (TSPs) and natural, permanent growth sample plots (PSPs). VDYP predicts volume (net decay) and diameters at four utilization levels using stand height, age, and density. The aerial approach uses crown closure as the density measure.

veteran trees: Mature living trees which are remnants of an older stand.

For more information

For more information or to obtain other inventory audit reports, contact: Director, Resources Inventory Branch, 722 Johnson Street, Victoria, BC, Canada V8W 3E7, Phone 250-387-1314, fax 250-387-5999, or visit our web site at http://www.for.gov.bc.ca/resinv/

July 1998

Inventory Audit Results:
Overview Prince George TSA
January, 1998

Results for the Prince George TSA 3
- *Total Bias* 4
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- *"Attibute" bias* 8
- *Audit height vs. Inventory height* 10
- *Audit age vs. Inventory age* 12
- *Operable*
  - *Total Bias* 14
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Audit age vs. Inventory age 68
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Total Bias 70
Inoperable 72

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"Model" bias 76
"Attribute" bias 78
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Audit age vs. Inventory age 82
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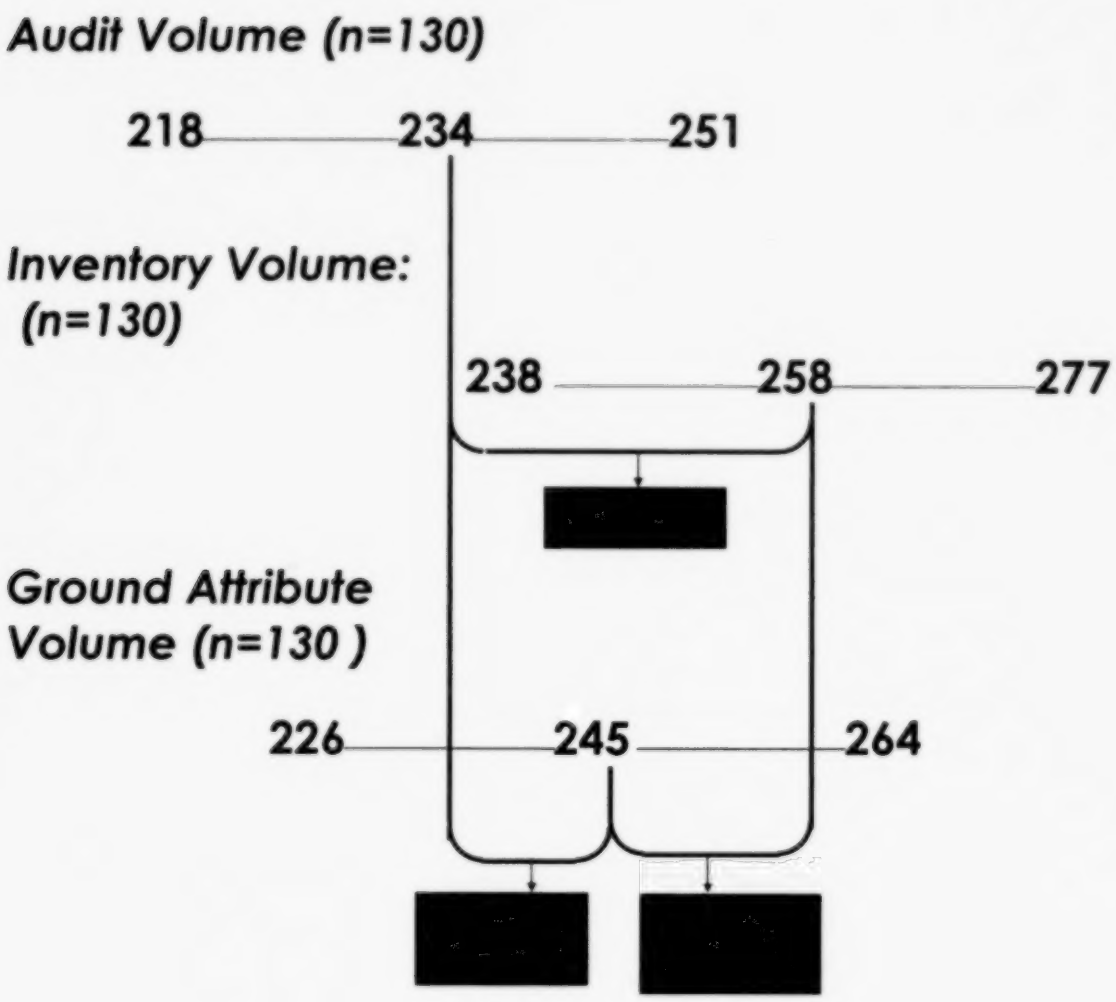
Total Bias 84
Inoperable
Total Bias 86

Prince George TSA*



* These results represent the unweighted mean of the total 130 samples that were taken randomly in the Prince George TSA. Note that the weighted average of the district averages will produce a similar but not the same result.

Prince George TSA

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=130)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

218 —— 234 —— 251

Audit Volume
(6.9% sampling error)

238 —— 258 —— 277

Inventory Volume
(map label attributes predicted in VDYP)
(7.5% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.91$

1.0
↓

0.85 —— 0.91 —— 0.97

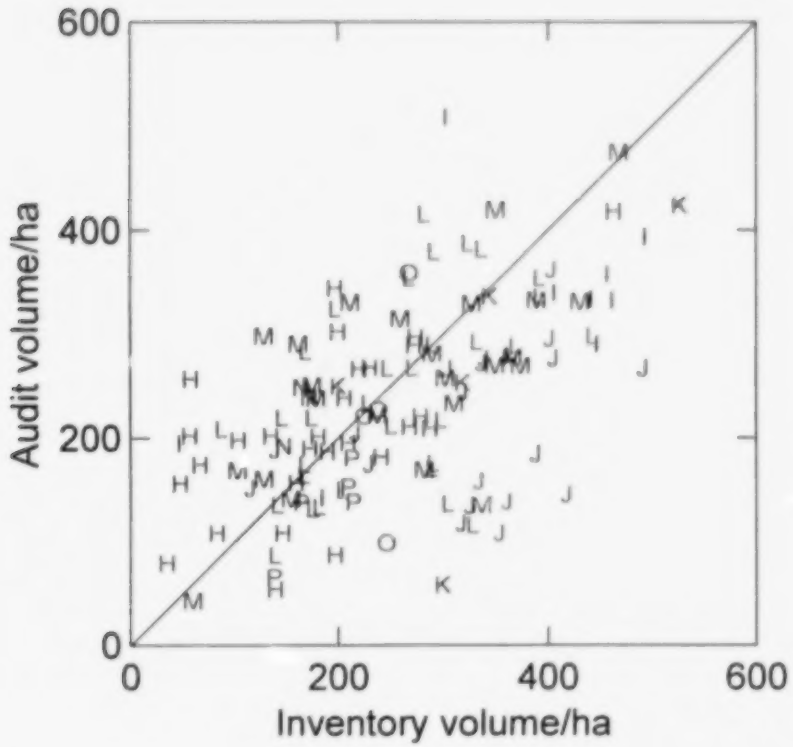
• *Since 1.0 is outside the interval, the ratio indicates that there is significant difference between the audit volume and the inventory volume.*

3. Paired T Test @ 95% (α=0.05) for all sample polygons
mean difference = -23.125 m^3/ha
p - value for mean difference = 0.008
•*since p-value < α, the difference is significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs J, N & P.
(for GTG J: mean difference = -115.125 m^3/ha; p-value<0.001; n=20
for GTG N: mean difference = 65.200 m^3/ha; p-value=0.029; n=3
for GTG P: mean difference = -53.380 m^3/ha; p-value=0.006; n=5)

5. Correlation @ 95% (α=0.05) for all samples
Correlation co-efficient r = 0.548
p value for correlation co-efficient < 0.001
.: correlation is significant

Prince George TSA
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy.BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=130)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2))*

218 —— 234 —— 251 Audit Volume (6.9% sampling error)

226 —— 245 —— 264 Ground Attribute Volume (predicted in VDYP) (7.8% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 0.96$$

1.0
↓

0.90 —— 0.96 —— 1.02

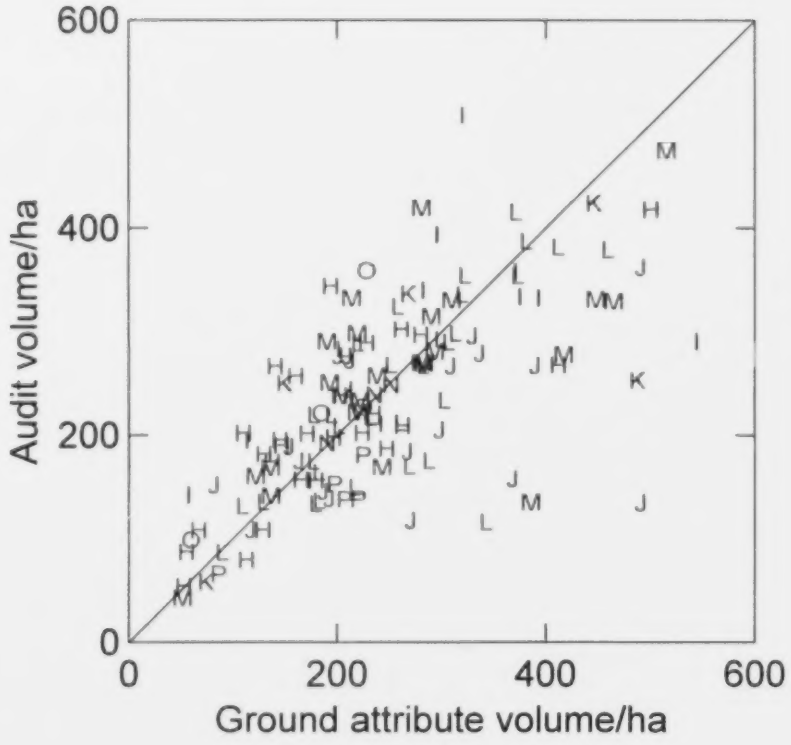
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the ground attribute volume.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -10.160 m^3/ha
p - value for mean difference = 0.171
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There was a significant difference within GTGs J and P.
(for GTG J: mean difference = -51.695 m^3/ha; p-value=0.045; n=20
for GTG P: mean difference = -52.740 m^3/ha; p-value=0.008; n=5)

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.669
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=130)

1. Average volumes/ha and confidence interval @ 95%
(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

226——245——264 Ground Attribute Volume (predicted in VDYP) (7.8% sampling error)

238——258——277 Inventory Volume (map label attributes predicted in VDYP) (7.5% sampling error)

2. Ratio Analysis : Ratio of Means @ 95%

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 0.95$$

1.0 ↓

0.89——0.95——1.01

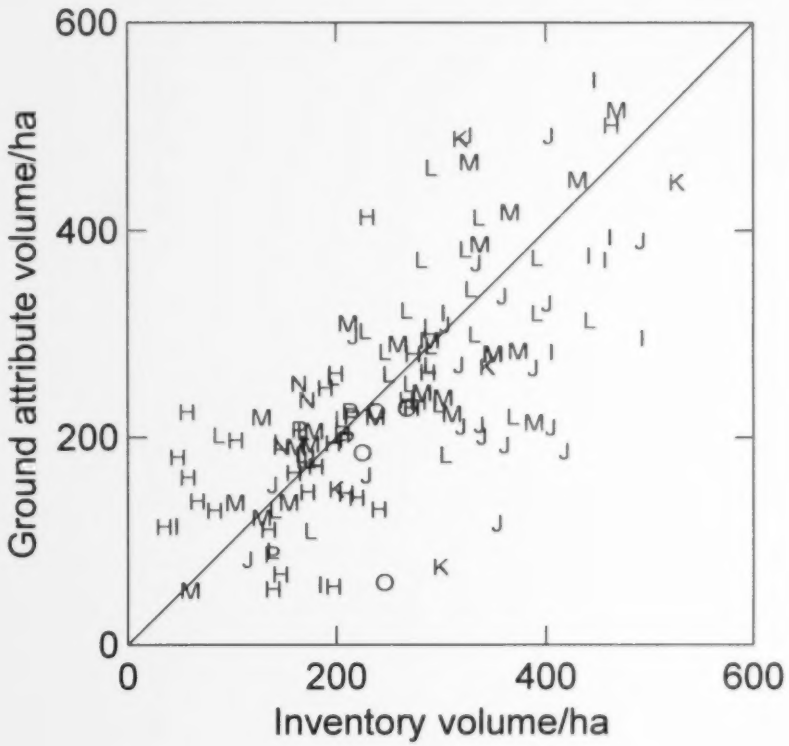
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -12.965 m^3/ha
p - value for mean difference = 0.092
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs J and N.
(for GTG J: mean difference = -63.430 m^3/ha; p-value=0.017; n=20
for GTG N: mean difference = 64.700 m^3/ha; p-value=0.036; n=3)

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.691
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA

Audit (ground measured) top height vs. Inventory Height (n=130)

1. Average height (m) and confidence interval @ 95%

21.8——22.7——23.7 Audit (ground measured) height (4.2% sampling error)

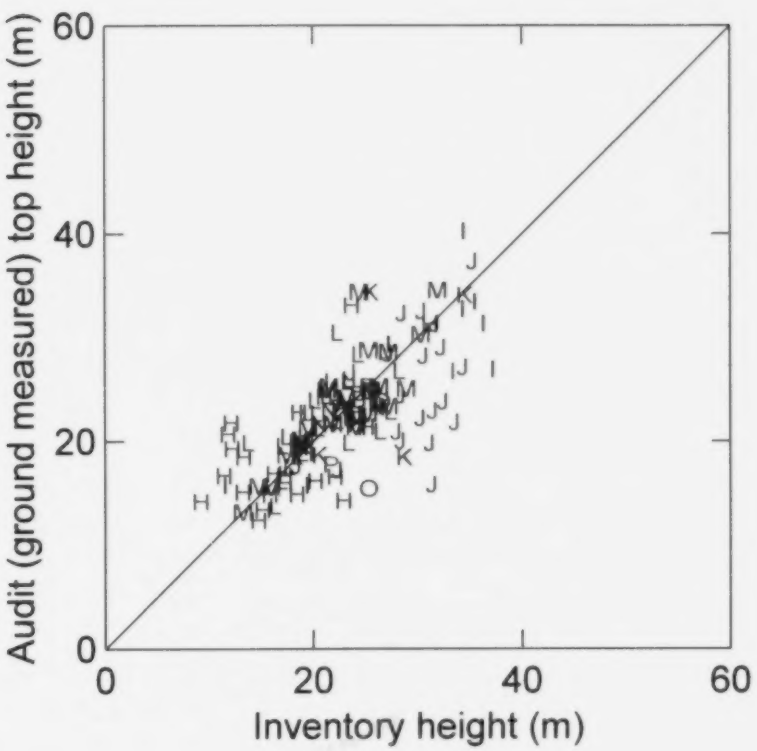
22.2——23.3——24.3 Inventory height (4.6% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -0.534 m
p - value for mean difference = 0.179
**since p - value > α, the difference is not significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There was a significant differences within GTG J.
(for GTG J: mean difference = -4.455 m; p-value=0.002; n=20)

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.706
p - value for correlation co-efficient < 0.001
.: correlation is significant

PRINCE GEORGE TSA
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA

Audit (ground measured) age of top height trees vs. Inventory age (n=130)

1. Average age (years) and confidence interval @ 95%

117——125——132 Audit (ground measured) age (5.9% sampling error)

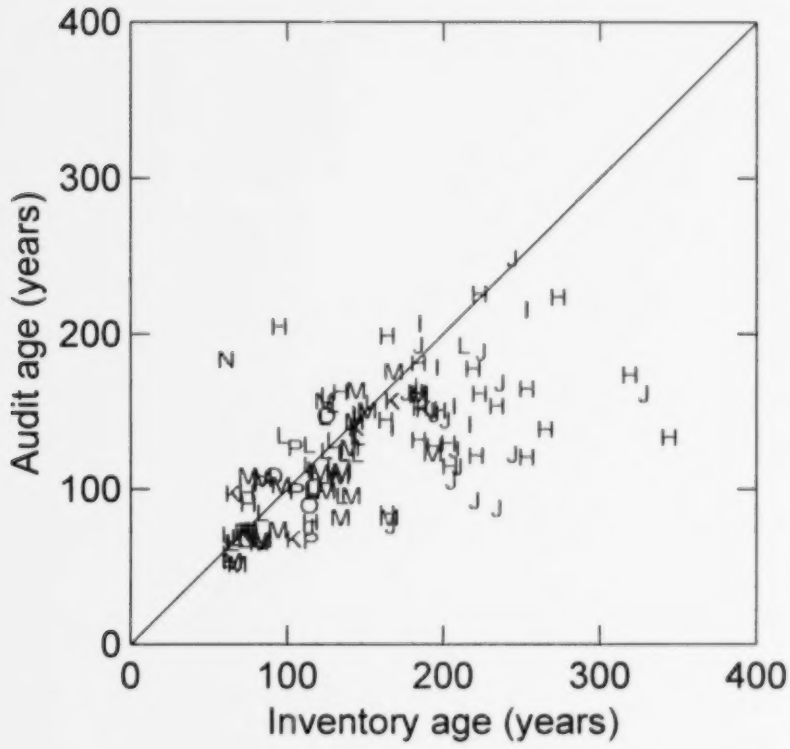
139——150——160 Inventory age (7.2% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -25.049 years
p - value for mean difference < 0.001
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs H, I, J & M.
(for GTG H: mean difference = -49.2 years; p-value<0.001; n=28
for GTG I: mean difference = -23.3 years; p-value=0.048; n=9
for GTG J: mean difference = -62.8 years; p-value<0.001; n=20
for GTG M: mean difference = -14.4 years; p-value=0.023; n=24)

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.630
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: OPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=98)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

230 ——— 249 ——— 268

Audit Volume
(7.6% sampling error)

265 ——— 286 ——— 307

Inventory Volume
(map label attributes predicted in VDYP)
(7.3% sampling error)

2. Ratio Analysis : Ratio of Means @95% for operable samples

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.87$

1.0
↓

0.81 ——— 0.87 ——— 0.94

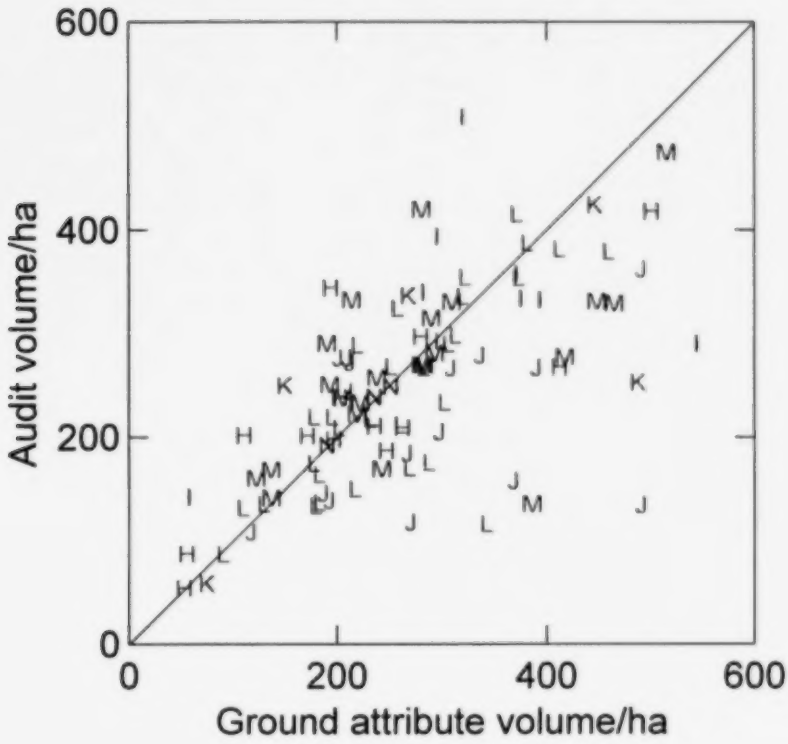
* *Since 1.0 is outside the interval, the ratio indicates that there is a significant difference between the audit volume and the inventory volume for the operable samples.*

3. Paired T Test @ 95% (α=0.05) for operable samples
mean difference = -37.161 m^3/ha
p - value for mean difference < 0.001
**since p-value < α, the difference is significant*

4. Paired T Test @ 95% for operable samples by map label GTG
There were significant differences within GTGs J and N.
(for GTG J: mean difference = -139.312 m^3/ha; p-value<0.001; n=16
for GTG N: mean difference = 65.200 m^3/ha; p-value=0.029; n=3)

5. Correlation @ 95% (α=0.05) for operable samples
Correlation co-efficient r = 0.503
p value for correlation co-efficient < 0.001
.: correlation is significant

Prince George TSA: OPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: OPERABLE SAMPLES

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=98)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2))*

230——249——268

Audit Volume
(7.6% sampling error)

247——269——292

Ground Attribute Volume
(predicted in VDYP)
(8.3% sampling error)

2. Ratio Analysis : Ratio of Means @95% for operable samples

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 0.92$$

1.0
↓

0.86——0.92——0.99

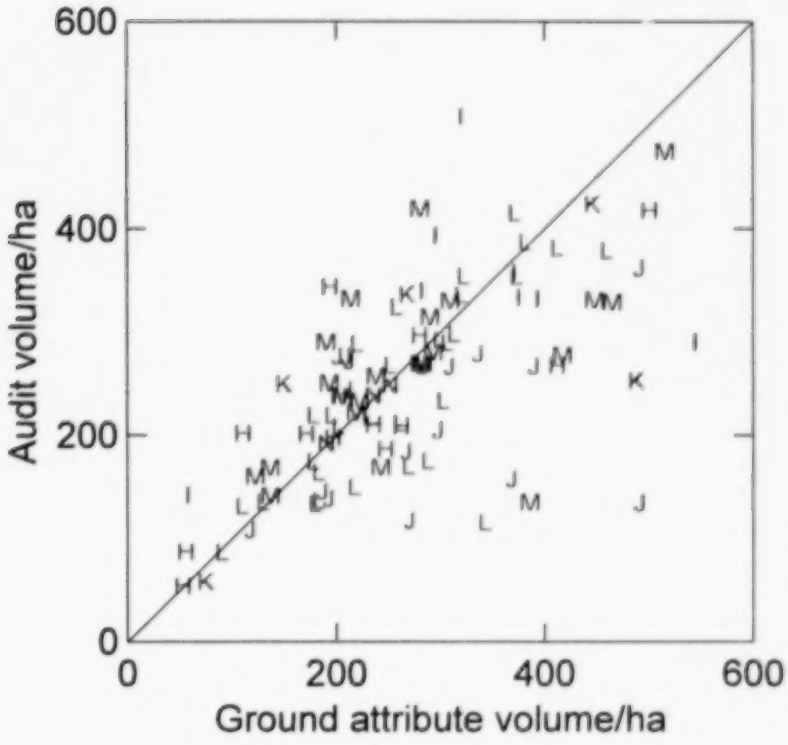
** Since 1.0 is outside the interval, the ratio indicates that there is a significant difference between the audit volume and the ground attribute volume for the operable samples.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for operable samples
mean difference = -20.274 m^3/ha
p - value for mean difference = 0.028
**since p - value < α, the difference is significant*

4. Paired T Test @ 95% for operable sample polygons by map label GTG
There was a significant difference within GTG J.
(for GTG J: mean difference = -69.719 m^3/ha; p-value=0.025; n=16)

5. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.628
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA: OPERABLE
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: OPERABLE SAMPLES

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=98)

1. Average volumes/ha and confidence interval @ 95%
(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

247——————269——————292 Ground Attribute Volume (predicted in VDYP) (8.3% sampling error)

265——————286——————307 Inventory Volume (map label attributes predicted in VDYP) (7.3% sampling error)

2. Ratio Analysis : Ratio of Means @ 95% for operable samples

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 0.94$$

1.0
↓
0.88——————0.94——————1.00

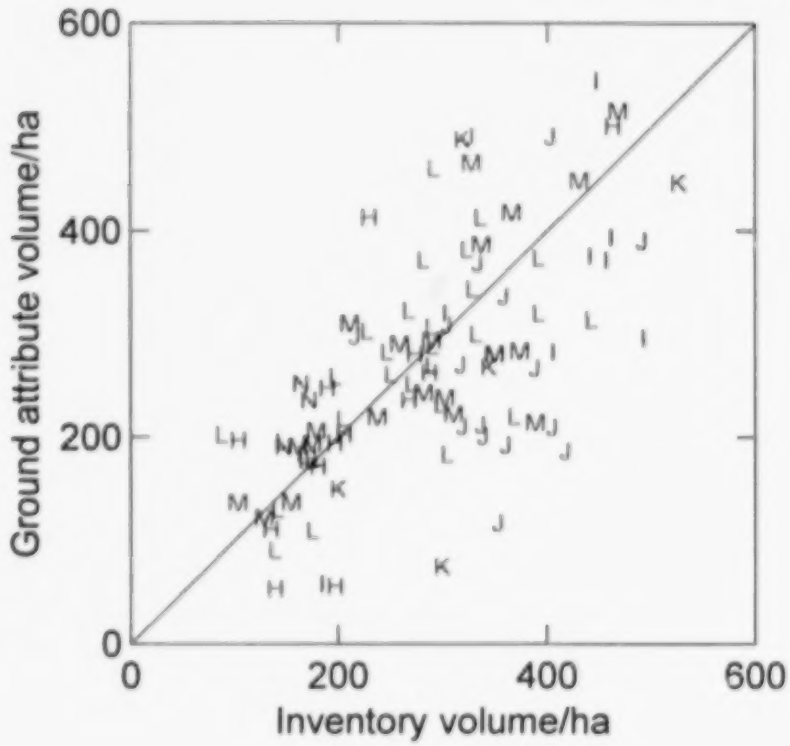
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP for the operable samples.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for operable samples
mean difference = -16.887 m^3/ha
p - value for mean difference = 0.068
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for operable samples by map label GTG
There were significant differences within GTGs J & N.
(for GTG J: mean difference = -69.954 m^3/ha; p-value=0.034; n=16
for GTG N: mean difference = 64.700 m^3/ha; p-value=0.036; n=3)

5. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.645
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA: OPERABLE
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: OPERABLE SAMPLES

Audit (ground measured) top height vs. Inventory Height (n=98)

1. Average height (m) and confidence interval @ 95%

22.7——23.8——25.0 Audit (ground measured) height (4.7% sampling error)

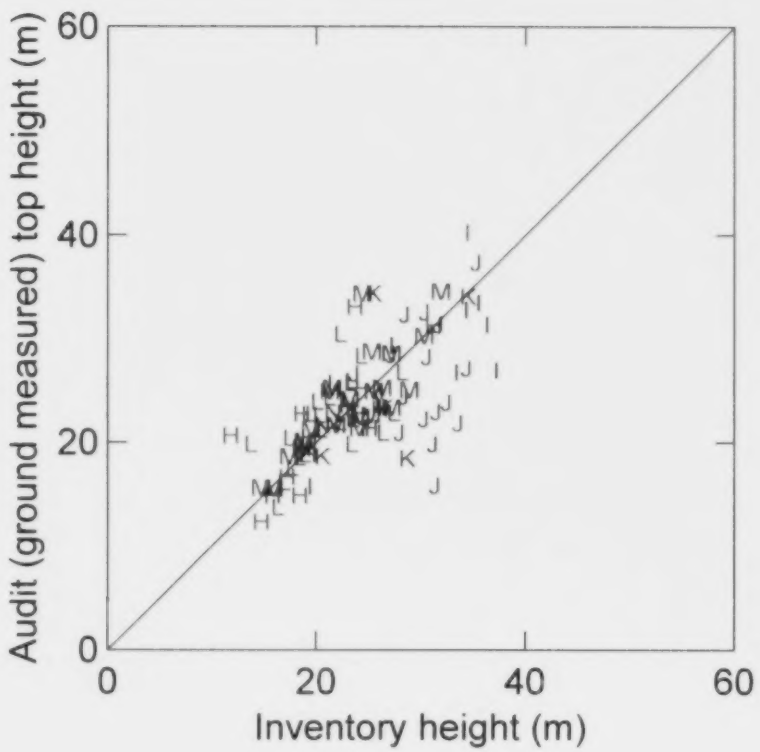
23.2——24.4——25.5 Inventory height (4.8% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for operable samples
mean difference = -0.523 m
p - value for mean difference = 0.256
**since p - value > α, the difference is not significant*

3. Paired T Test @ 95% for operable sample polygons by map label GTG
There was a significant difference within GTG J.
(for GTG J: mean difference = -4.488 m; p-value=0.010; n=16)

4. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.681
p - value for correlation co-efficient < 0.001
.: correlation is significant

PRINCE GEORGE TSA: OPERABLE
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: OPERABLE SAMPLES

Audit (ground measured) age of top height trees vs. Inventory age (n=98)

1. Average age (years) and confidence interval @ 95%

116——125——134 Audit (ground measured) age
(7.2% sampling error)

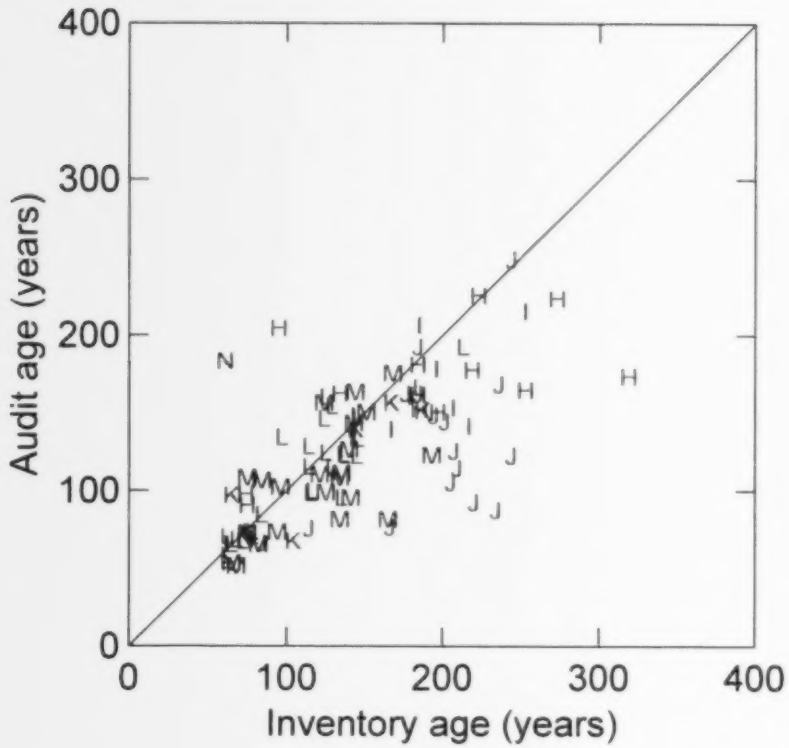
132——144——155 Inventory age
(8.1% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for operable sample polygons
mean difference = -18.763 years
p - value for mean difference < 0.001
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for operable sample polygons by map label GTG
There were significant differences within GTGs H, I, J & M.
(for GTG I: mean difference = -26.0 years; p-value=0.049; n=8
for GTG J: mean difference = -63.5 years; p-value<0.001; n=16
for GTG M: mean difference = -13.9 years; p-value=0.042; n=22)

4. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.681
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA: OPERABLE
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, PS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: INOPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=32)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

163 ——— 190 ——— 217 Audit Volume (14.4% sampling error)

139 ——— 170 ——— 201 Inventory Volume (map label attributes predicted in VDYP) (18.2% sampling error)

2. Ratio Analysis : Ratio of Means @95% for inoperable samples

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 1.12$

1.0
↓

0.92 ——— 1.12 ——— 1.31

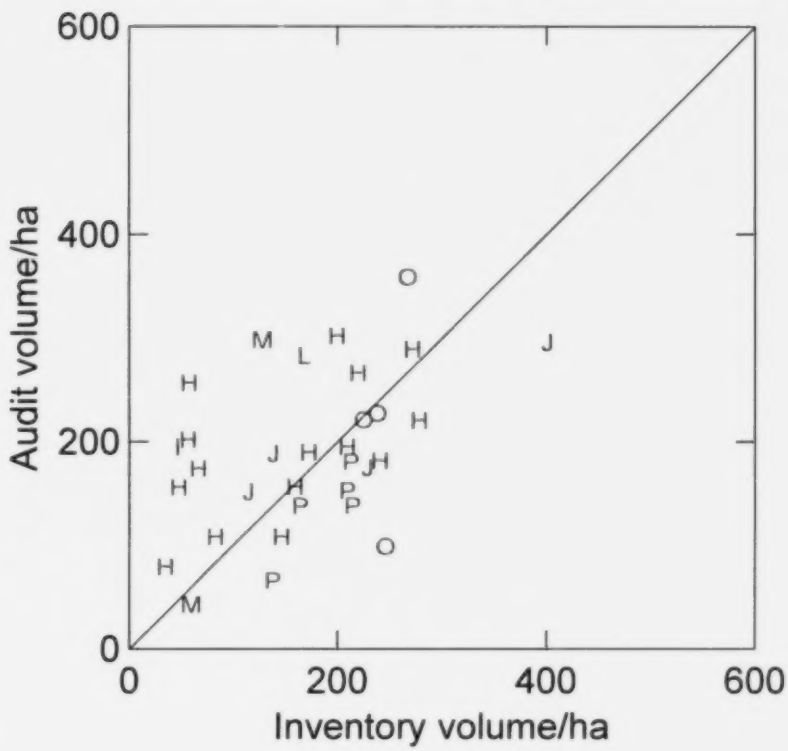
***** *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume for the inoperable samples.*

3. Paired T Test @ 95% (α=0.05) for inoperable sample polygons
mean difference = 19.859 m^3/ha
p - value for mean difference = 0.195
**since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for inoperable sample polygons by map label GTG
There were significant differences within GTGs H and P.
(for GTG H: mean difference = 42.167 m^3/ha; p-value=0.050; n=15
for GTG P: mean difference = -53.380 m^3/ha; p-value=0.006; n=5)

5. Correlation @ 95% (α=0.05) for inoperable samples
Correlation co-efficient r = 0.455
p value for correlation co-efficient = 0.009
∴ correlation is significant

Prince George TSA: INOPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: INOPERABLE SAMPLES

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=32)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2)*

163——190——217 Audit Volume (14.4% sampling error)

146——169——192 Ground Attribute Volume (predicted in VDYP) (13.6% sampling error)

2. Ratio Analysis : Ratio of Means @95% for inoperable samples

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 1.12$$

1.0

↓

1.003——1.12——1.24

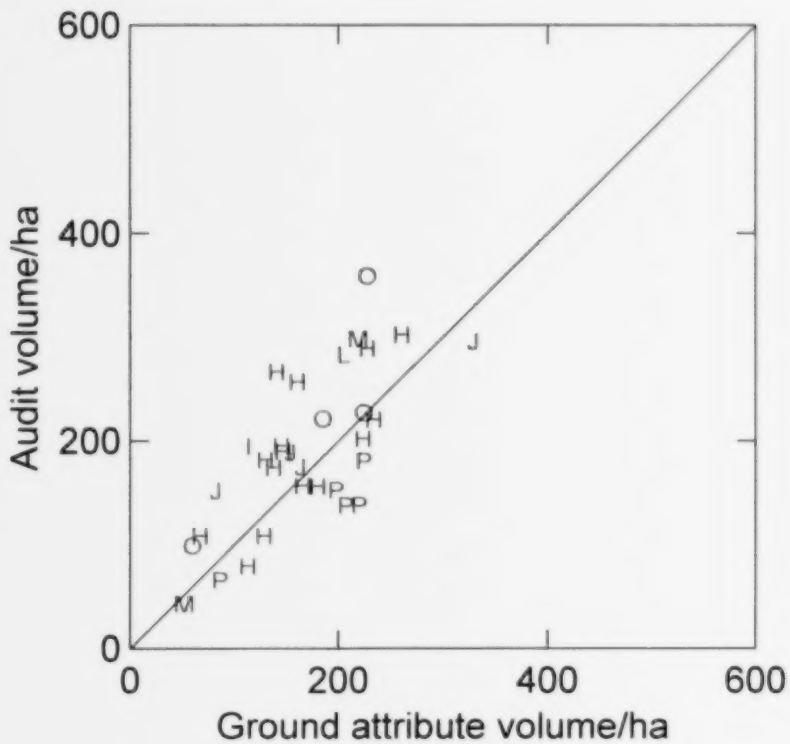
* *Since 1.0 is outside the interval, the ratio indicates that there is a significant difference between the audit volume and the ground attribute volume for the inoperable samples.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for inoperable sample polygons
mean difference = 20.816 m^3/ha
p - value for mean difference = 0.038
**since p - value < α, the difference is significant*

4. Paired T Test @ 95% for inoperable sample polygons by map label GTG
There were significant differences within GTGs H & P.
(for GTG H: mean difference = 27.540 m^3/ha; p-value=0.041; n=15
for GTG P: mean difference = -52.740 m^3/ha; p-value=0.008; n=5)

5. Correlation @95%($\alpha = 0.05$) for inoperable samples
Correlation co-efficient r = 0.712
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA: INOPERABLE
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: INOPERABLE SAMPLES

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=32)

1. Average volumes/ha and confidence interval @ 95%

(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

146——169——192 Ground Attribute Volume (predicted in VDYP) (13.6% sampling error)

139——170——201 Inventory Volume (map label attributes predicted in VDYP) (18.2% sampling error)

2. Ratio Analysis : Ratio of Means @ 95% for inoperable samples

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 0.99$$

1.0
↓
0.84——0.99——1.15

** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP for the inoperable samples.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for inoperable sample polygons

mean difference = -0.956 m^3/ha

p - value for mean difference = 0.943

**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for inoperable sample polygons by map label GTG

There were no significant difference within any of the GTGs.

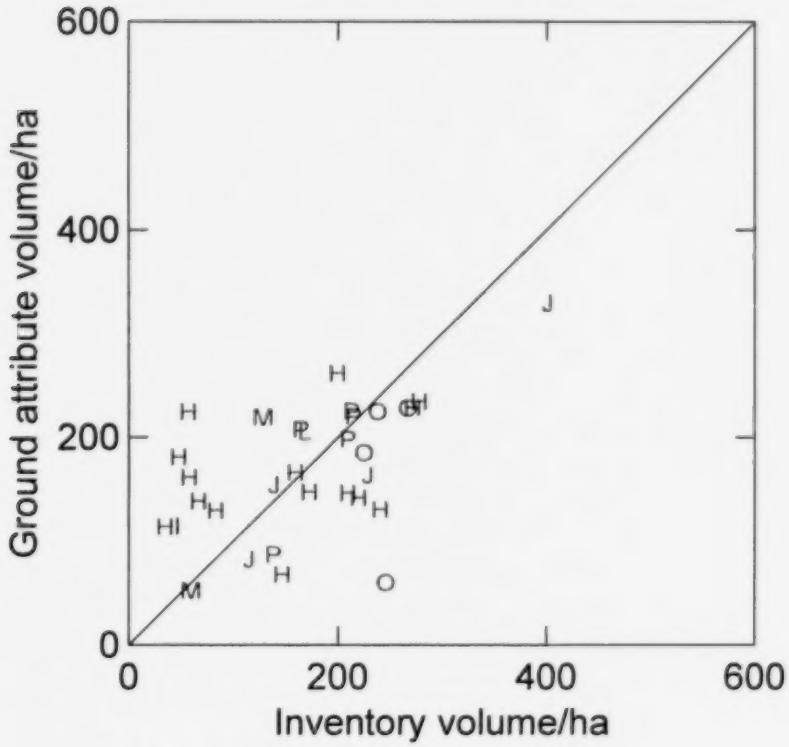
5. Correlation @95%($\alpha = 0.05$) for inoperable samples

Correlation co-efficient r = 0.532

p - value for correlation co-efficient = 0.002

∴ correlation is significant

PRINCE GEORGE TSA: INOPERABLE
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPI,HC,HB,HS*	L	*pure PI or Pa*
H	*B, BH, BS,BF,BPw,BPI,BL,BPy,BDecid.*	M	*PI F, PI Py,PI L,PI Pw,PI S,PI B,PI H,PIC*
I	*pure S*	N	*PI Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPI*	O	*Dconif., AtConif*
K	*S PI , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: INOPERABLE SAMPLES

Audit (ground measured) top height vs. Inventory Height (n=32)

1. Average height (m) and confidence interval @ 95%

17.8——19.3——20.8 Audit (ground measured) height (7.7% sampling error)

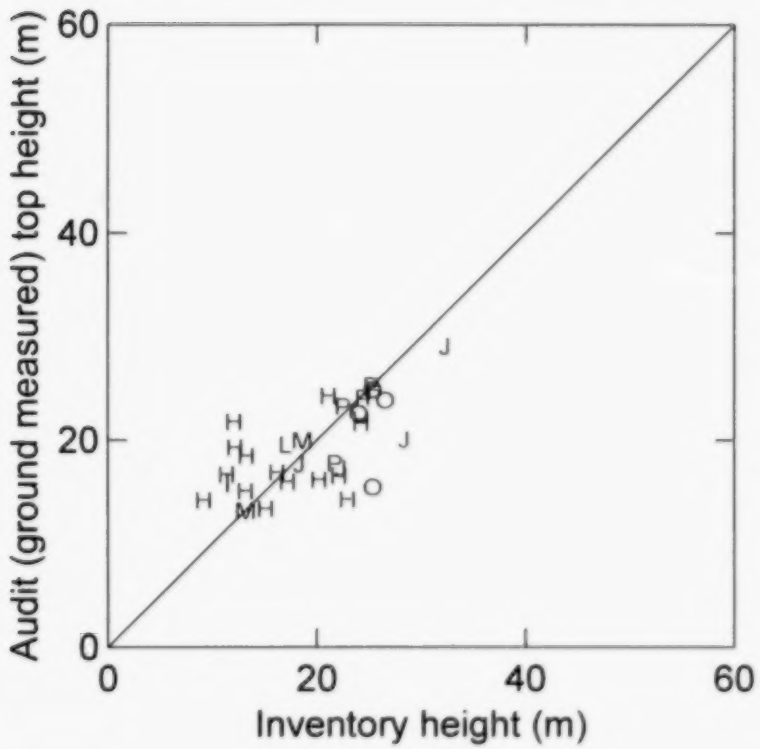
17.8——19.9——22.0 Inventory height (10.6% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for inoperable samples
mean difference = -0.566 m
p - value for mean difference = 0.480
**since p - value > α, the difference is not significant*

3. Paired T Test @ 95% for inoperable sample polygons by map label GTG
There were no significant differences within any of the GTGs.

4. Correlation @95%($\alpha = 0.05$) for inoperable samples
Correlation co-efficient r = 0.645
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE TSA: INOPERABLE
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George TSA: INOPERABLE SAMPLES

Audit (ground measured) age of top height trees vs. Inventory age (n=32)

1. Average age (years) and confidence interval @ 95%

112——124——136 Audit (ground measured) age
(9.7% sampling error)

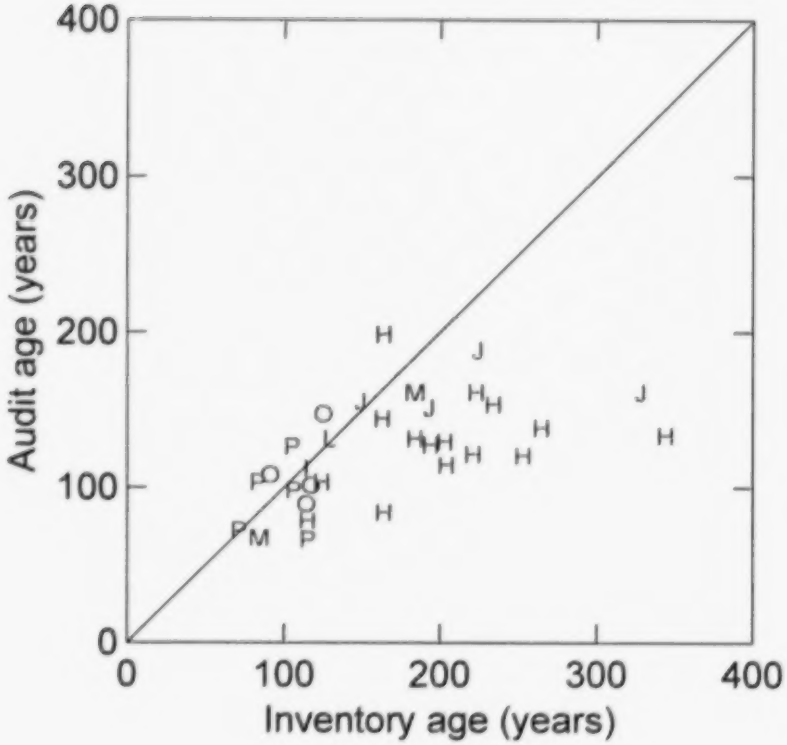
143——168——193 Inventory age
(14.8% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for inoperable sample polygons
mean difference = -44.297 years
p - value for mean difference < 0.001
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for inoperable sample polygons by map label GTG
There was a significant difference within GTG H.
(for GTG H: mean difference = -74.8 years; p-value<0.001; n=15)

4. Correlation @95%($\alpha = 0.05$) for inoperable samples
Correlation co-efficient r = 0.554
p - value for correlation co-efficient = 0.001
.: correlation is significant

PRINCE GEORGE TSA: INOPERABLE
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Inventory Classification Assessment

- **52%** of the growth type groups from the inventory (ie. map labels) matched the audit growth type groups.
- the growth type group distribution for the 130 inventory audit samples is as follows (the bold italic entries on the diagonal in the table indicate a GTG match between the audit and the inventory):

Audit GTG	***Inventory GTG (columns)***										
(rows)	G	H	I	J	K	L	M	N	O	P	*total*
G	***0***	1	0	1	0	0	0	0	0	0	2
H	0	***22***	1	5	1	0	1	0	0	0	30
I	0	0	***2***	4	0	0	0	0	0	0	6
J	0	4	5	***7***	1	0	1	0	1	0	19
K	0	1	1	2	***2***	0	6	0	0	0	12
L	0	0	0	0	0	***20***	3	2	0	0	25
M	0	0	0	1	0	12	***12***	1	0	0	26
N	0	0	0	0	0	0	1	***0***	0	0	1
O	0	0	0	0	0	0	0	0	***1***	3	4
P	0	0	0	0	1	0	0	0	2	***2***	5
total	0	28	9	20	5	32	24	3	4	5	**130**

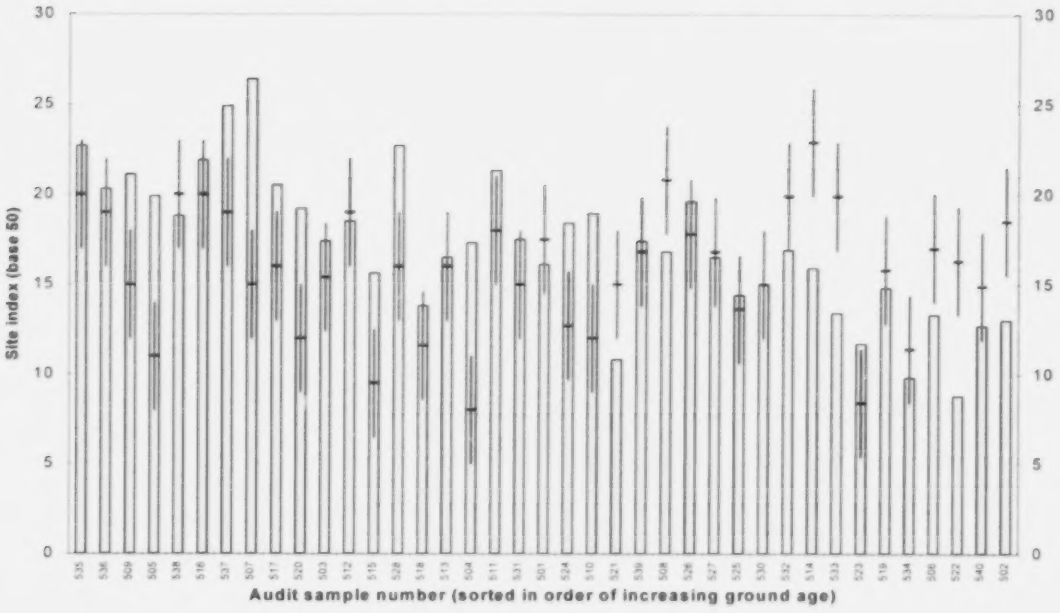
Letter symbols correspond to GTG's as follows:

G	*HF,HL,HPy,HPw,HPI,HC,HB,HS*	L	*pure PI or Pa*
H	*B, BH, BS,BF,BPw,BPI,BL,BPy,BDecid.*	M	*PI F, PI Py,PI L,PI Pw,PI S,PI B,PI H,PIC*
I	*pure S*	N	*PI Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPI*	O	*Dconif., AtConif*
K	*S PI , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Immature Site Index and Classification Assessment

- **44 %** of the growth type group assignments from the inventory (ie. map labels) matched the corresponding audit growth type group assignment.

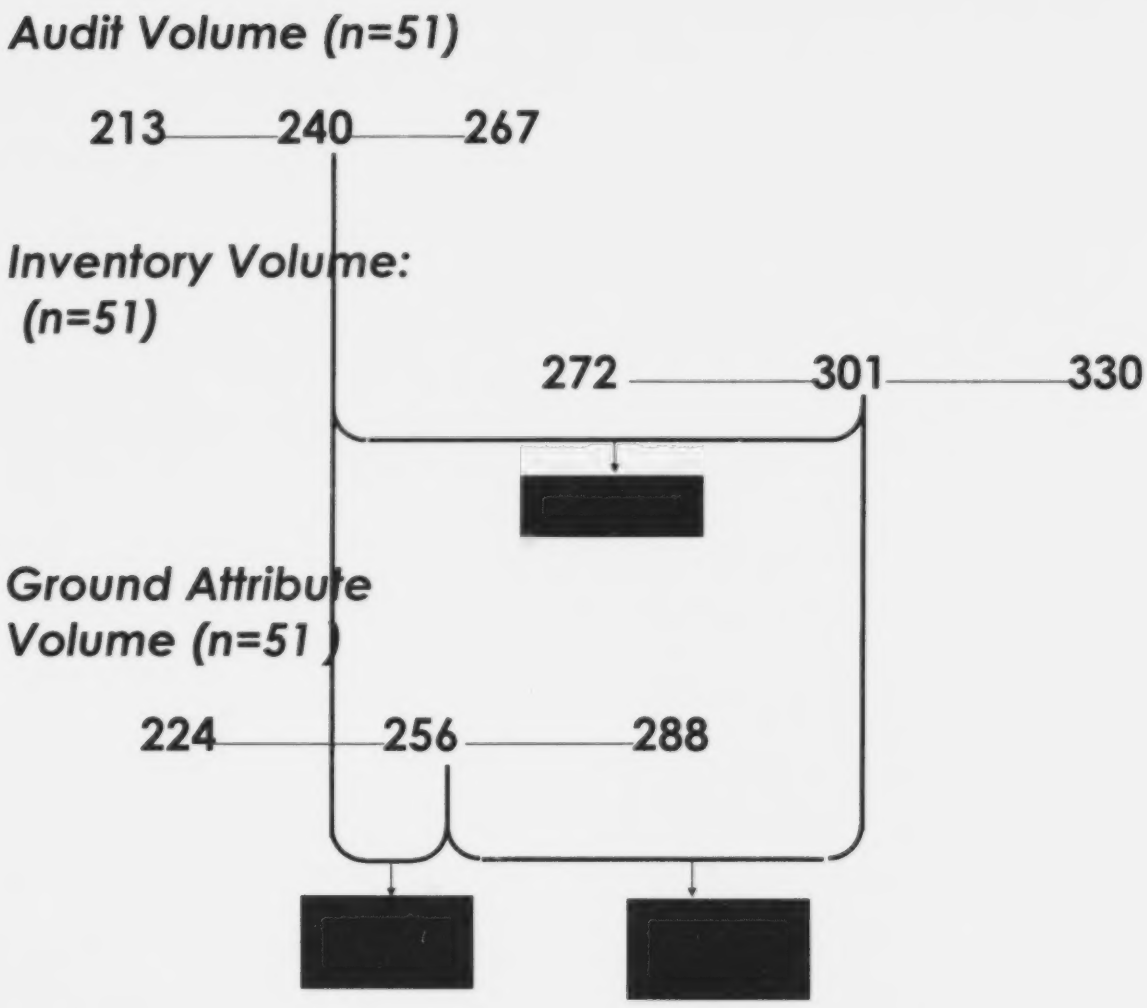
PRINCE GEORGE TSA Inventory Audit:
Comparison of Inventory and Audit Site Index
for Immature Samples



Notes:

- shaded bars correspond to ***audit site index*** values
- tick marks on vertical lines represent ***inventory site index*** (vertical lines have arbitrarily been set at ±3m around site index)
- audit site indices based on BH age (using SiteTool)
- inventory site index was within 3m of the audit site index for 19 out of 39 samples (inventory site index was more than 3m higher than the audit site index for 7 samples and more than 3m lower for 13 samples)
- audit TH species did not match inventory leading spp. for 14 samples; alternate audit TH's were available for 8 of these; however, using the alternate SI's the results above did not change.

Prince George District*



* These results represent the unweighted mean of the samples that fell within the Prince George District of the Prince George TSA.

Prince George District

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=51)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

213 —— 240 —— 267

Audit Volume
(11.4% sampling error)

272 —— 301 —— 330

Inventory Volume
(map label attributes predicted in VDYP)
(9.7% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.80$

1.0
↓

0.71 —— 0.80 —— 0.88

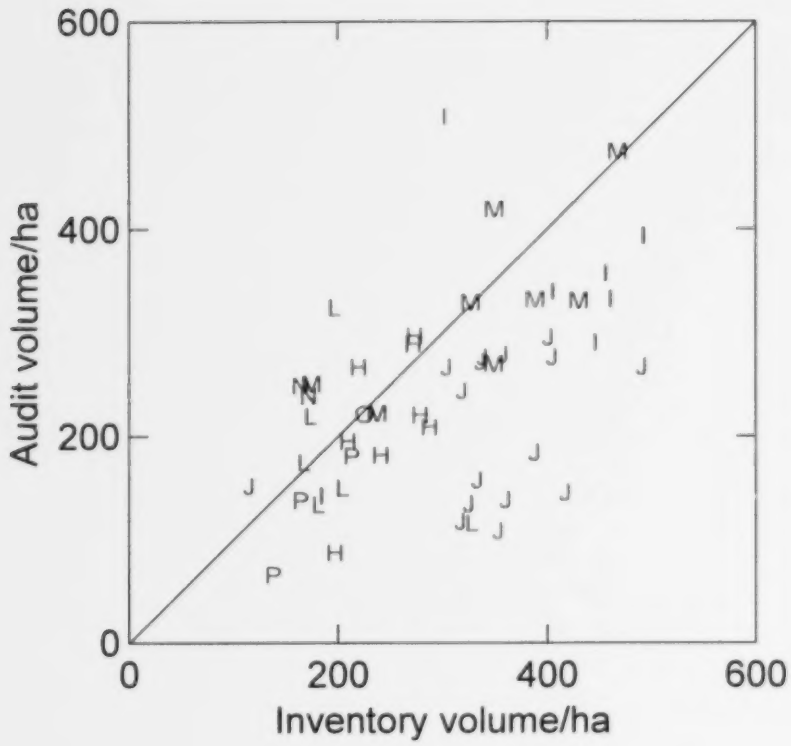
* *Since 1.0 is outside the interval, the ratio indicates that there is significant difference between the audit volume and the inventory volume.*

3. Paired T Test @ 95% (α=0.05) for all sample polygons
mean difference = -60.624 m^3/ha
p - value for mean difference < 0.001
**since p-value < α, the difference is significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There was a significant difference within GTG J.
(for GTG J: mean difference = -140.362 m^3/ha; p-value<0.001; n=16)

5. Correlation @ 95% (α=0.05) for all samples
Correlation co-efficient r = 0.502
p value for correlation co-efficient < 0.001
∴ correlation is significant

Prince George District
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=51)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2))*

213 —— 240 —— 267

Audit Volume
(11.4% sampling error)

224 —— 256 —— 288

Ground Attribute Volume
(predicted in VDYP)
(12.4% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 0.94$$

1.0
↓

0.83 —— 0.94 —— 1.05

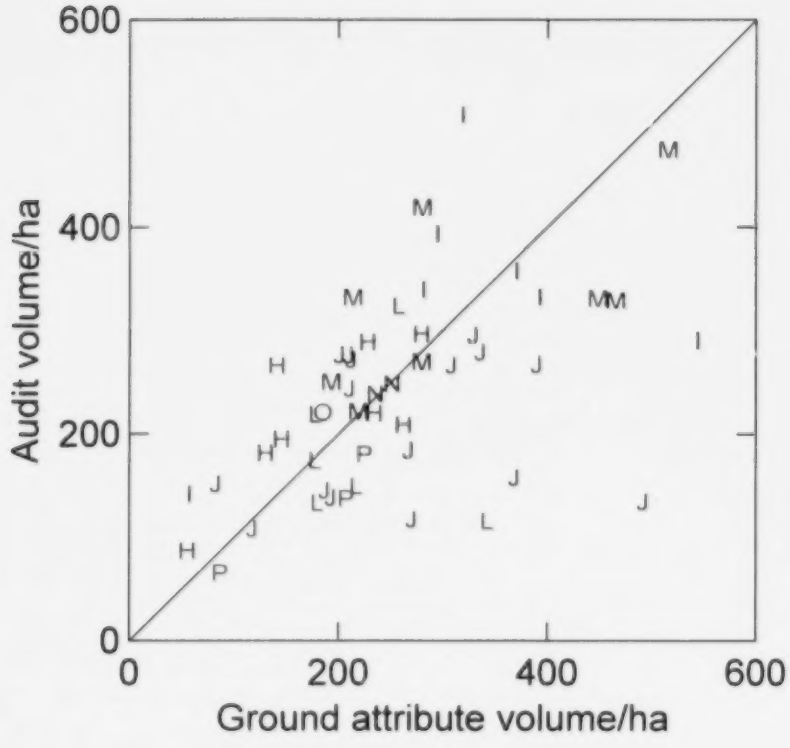
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the ground attribute volume.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -16.126 m^3/ha
p - value for mean difference = 0.269
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.526
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE District
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=51)

1. Average volumes/ha and confidence interval @ 95%

(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

224 —— 256 —— 288

Ground Attribute Volume
(predicted in VDYP)
(12.4% sampling error)

272 —— 301 —— 330

Inventory Volume
(map label attributes predicted in VDYP)
(9.7% sampling error)

2. Ratio Analysis : Ratio of Means @ 95%

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 0.85$$

1.0
↓

0.77 —— 0.85 —— 0.93

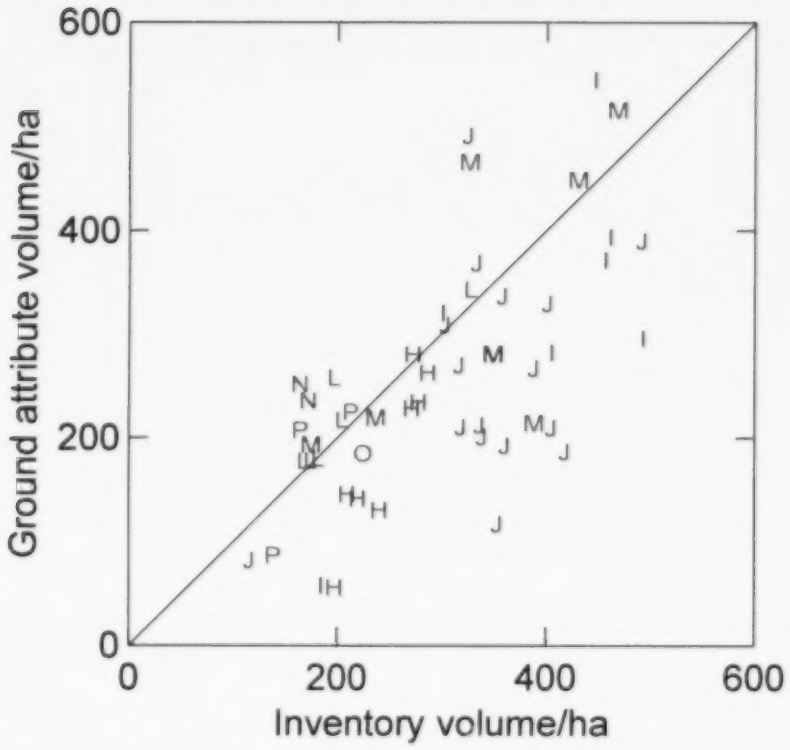
** Since 1.0 is outside the interval, the ratio indicates that there is a significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -44.498 m^3/ha
p - value for mean difference = 0.001
**since p - value < α, the difference is significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs H and J.
(for GTG H: mean difference = -62.687 m^3/ha; p-value=0.007; n=8
for GTG J: mean difference = -86.738 m^3/ha; p-value=0.005; n=16)

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.654
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE District
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District

Audit (ground measured) top height vs. Inventory Height (n=51)

1. Average height (m) and confidence interval @ 95%

22.5——24.1——25.7 Audit (ground measured) height (6.6% sampling error)

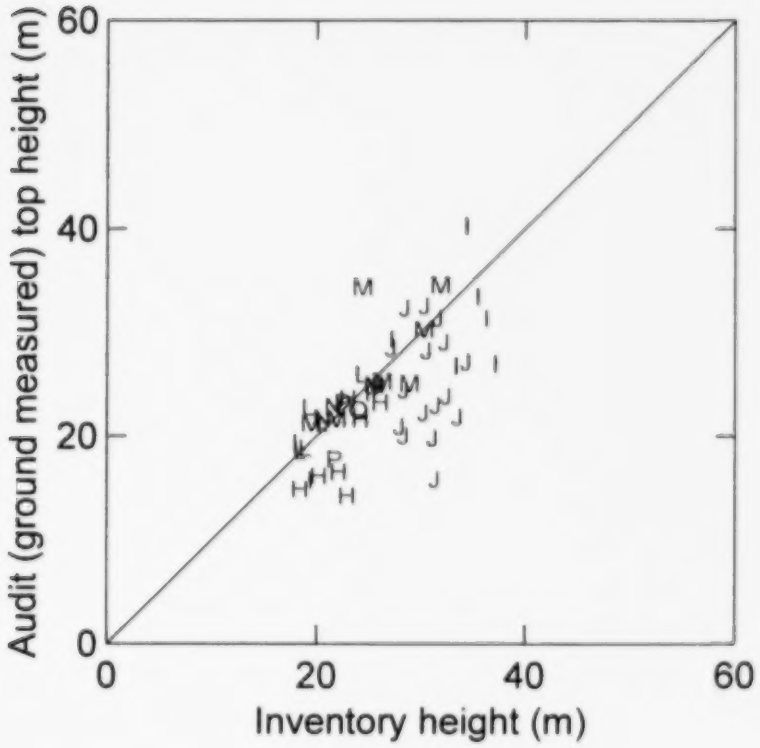
25.1——26.6——28.1 Inventory height (5.7% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -2.475 m
p - value for mean difference = 0.001
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs H & J.
(for GTG H: mean difference = -3.650 m; p-value=0.007; n=8
for GTG J: mean difference = -5.525 m; p-value=0.001; n=16)

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.618
p - value for correlation co-efficient < 0.001
.: correlation is significant

PRINCE GEORGE District
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District

Audit (ground measured) age of top height trees vs. Inventory age (n=51)

1. Average age (years) and confidence interval @ 95%

113——**125**——**137**

Audit (ground measured) age
(9.7% sampling error)

145——**163**——**182**

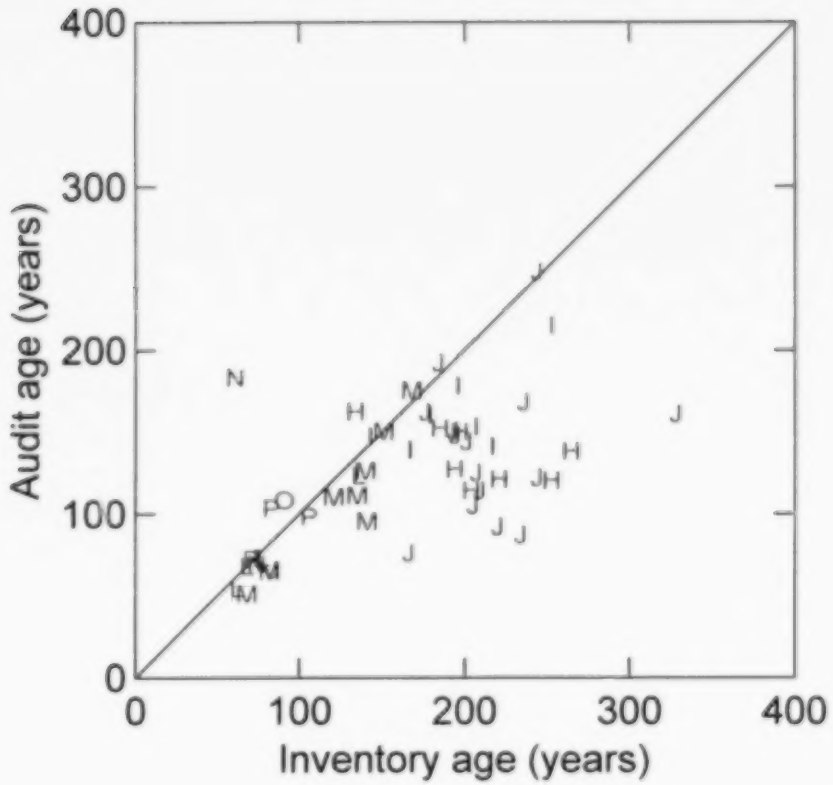
Inventory age
(11.3% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -38.726 years
p - value for mean difference < 0.001
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs H, I, J, L & M.
(for GTG H: mean difference = -71.1 years; p-value=0.007; n=8
for GTG I: mean difference = -32.7 years; p-value=0.016; n=7
for GTG J: mean difference = -72.8 years; p-value<0.001; n=16
for GTG L: mean difference = -6.1 years; p-value=0.021; n=6
for GTG M: mean difference = -15.4 years; p-value=0.028; n=8)

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.585
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE District
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: OPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=40)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

219——251——283

Audit Volume
(12.9% sampling error)

289——321——353

Inventory Volume
(map label attributes predicted in VDYP)
(10.0% sampling error)

2. Ratio Analysis : Ratio of Means @95% for operable samples

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.78$

1.0
↓

0.68——0.78——0.88

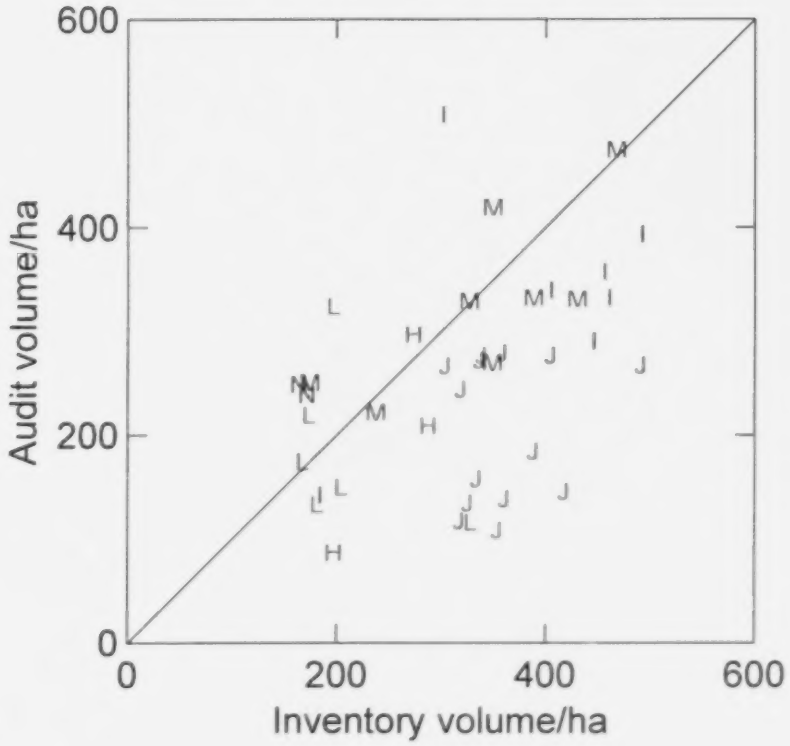
* *Since 1.0 is outside the interval, the ratio indicates that there is a significant difference between the audit volume and the inventory volume for the operable samples.*

3. Paired T Test @ 95% (α=0.05) for operable samples
mean difference = -70.403 m^3/ha
p - value for mean difference < 0.001
**since p-value < α, the difference is significant*

4. Paired T Test @ 95% for operable samples by map label GTG
There were significant differences within GTGs J.
(for GTG J: mean difference = -155.486 m^3/ha; p-value<0.001; n=14)

5. Correlation @ 95% (α=0.05) for operable samples
Correlation co-efficient r = 0.420
p value for correlation co-efficient = 0.007
∴ correlation is significant

Prince George District: OPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,£Decid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: OPERABLE SAMPLES

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=40)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2))*

219——251——283

Audit Volume
(12.9% sampling error)

240——277——313

Ground Attribute Volume
(predicted in VDYP)
(13.1% sampling error)

2. Ratio Analysis : Ratio of Means @95% for operable samples

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 0.91$$

1.0
↓

0.79——0.91——1.03

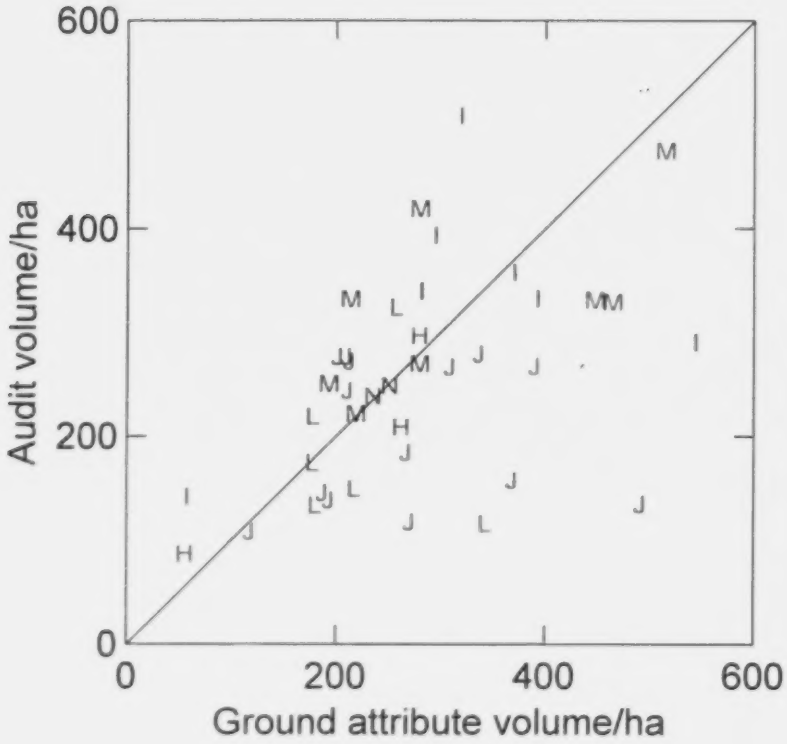
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the ground attribute volume for the operable samples.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for operable samples
mean difference = -25.738 m^3/ha
p - value for mean difference = 0.150
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for operable sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.473
p - value for correlation co-efficient = 0.002
.: correlation is significant

PRINCE GEORGE District: OPERABLE
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: OPERABLE SAMPLES

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=40)

1. Average volumes/ha and confidence interval @ 95%
(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

240——277——313

Ground Attribute Volume
(predicted in VDYP)
(13.1% sampling error)

289——321——353

Inventory Volume
(map label attributes predicted in VDYP)
(10.0% sampling error)

2. Ratio Analysis : Ratio of Means @ 95% for operable samples

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 0.86$$

1.0
↓

0.77——0.86——0.96

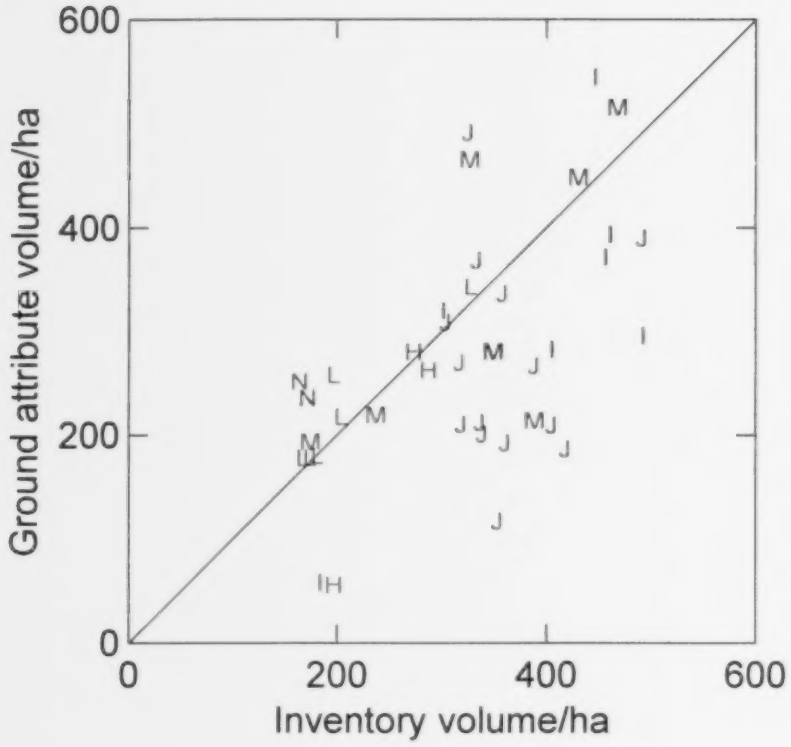
** Since 1.0 is outside the interval, the ratio indicates that there is a significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP for the operable samples.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for operable samples
mean difference = -44.665 m^3/ha
p - value for mean difference = 0.007
**since p - value < α, the difference is significant*

4. Paired T Test @ 95% for operable samples by map label GTG
There were significant differences within GTG J .
(for GTG J: mean difference = -91.650 m^3/ha; p-value=0.009; n=14)

5. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.569
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE District: OPERABLE
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: OPERABLE SAMPLES

Audit (ground measured) top height vs. Inventory Height (n=40)

1. Average height (m) and confidence interval @ 95%

23.3——25.1——26.9 Audit (ground measured) height (7.3% sampling error)

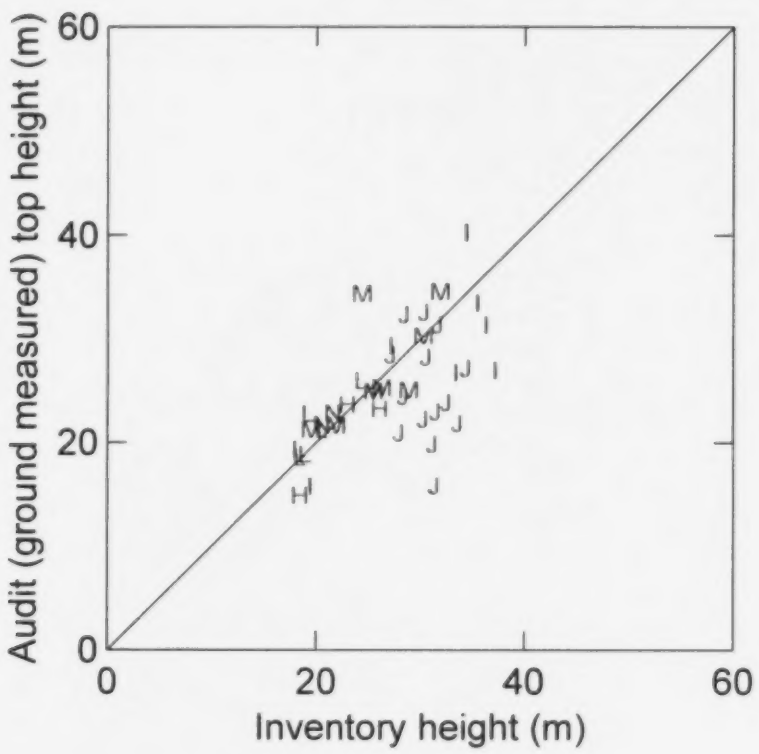
25.4——27.2——29.1 Inventory height (6.7% sampling error)

2. Paired T Test @ 95% (α = 0.05) for operable samples
mean difference = -2.133 m
p - value for mean difference = 0.014
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for operable sample polygons by map label GTG
There was a significant difference within GTG J.
(for GTG J: mean difference = -5.493 m; p-value=0.004; n=14)

4. Correlation @95%(α = 0.05) for operable samples
Correlation co-efficient r = 0.577
p - value for correlation co-efficient < 0.001
∴ correlation is significant

PRINCE GEORGE District: OPERABLE
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: OPERABLE SAMPLES

Audit (ground measured) age of top height trees vs. Inventory age (n=40)

1. Average age (years) and confidence interval @ 95%

111——————**126**——————**141**

Audit (ground measured) age
(11.9% sampling error)

139——————**158**——————**177**

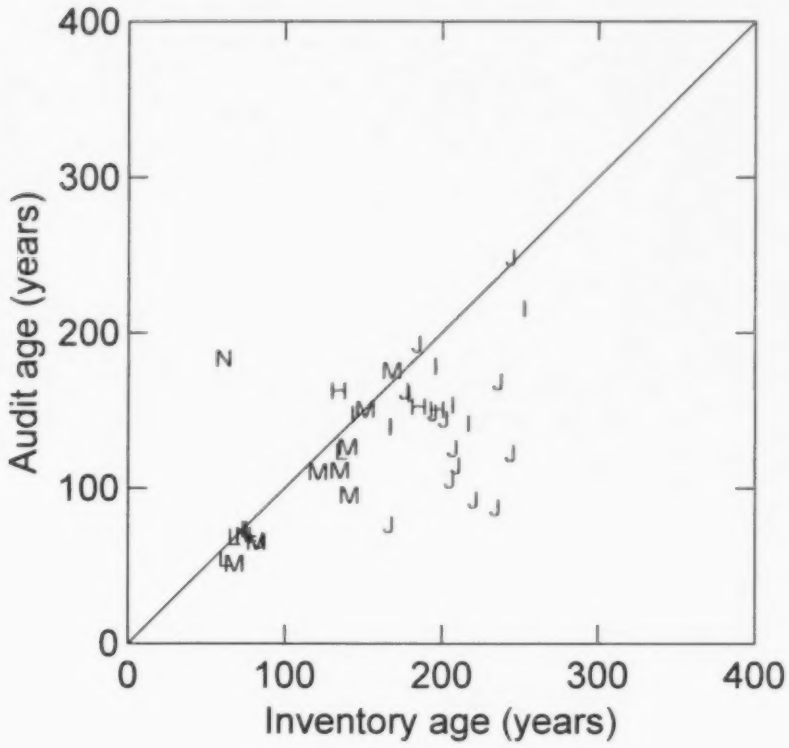
Inventory age
(12.0% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for operable sample polygons
mean difference = -31.975 years
p - value for mean difference < 0.001
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for operable sample polygons by map label GTG
There were significant differences within GTGs I, J, L & M.
(for GTG I: mean difference = -33 years; p-value=0.016; n=7
for GTG J: mean difference = -68 years; p-value<0.001; n=14
for GTG L: mean difference = -6 years; p-value=0.021; n=6
for GTG M: mean difference = -15 years; p-value=0.028; n=8)

4. Correlation @95%($\alpha = 0.05$) for operable samples
Correlation co-efficient r = 0.610
p - value for correlation co-efficient < 0.001
.: correlation is significant

PRINCE GEORGE District: OPERABLE
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: INOPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=11)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

154 ——— 200 ——— 246 Audit Volume (23.1% sampling error)

173 ——— 225 ——— 277 Inventory Volume (map label attributes predicted in VDYP) (23.1% sampling error)

2. Ratio Analysis : Ratio of Means @95% for inoperable samples

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.89$

1.0 ↓

0.76 ——— 0.89 ——— 1.02

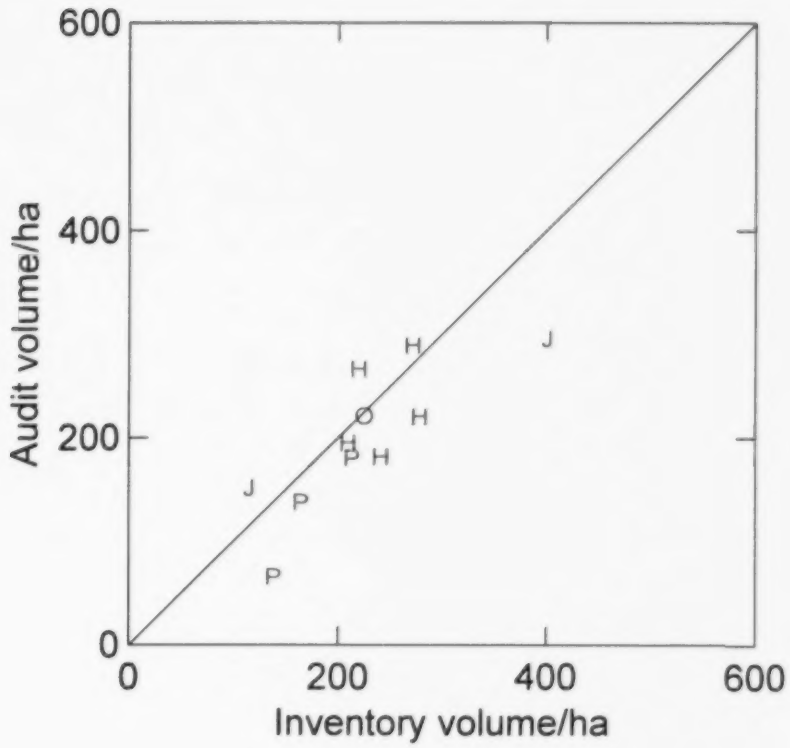
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume for the inoperable samples.*

3. Paired T Test @ 95% (α=0.05) for inoperable sample polygons
mean difference = -25.064 m^3/ha
p - value for mean difference = 0.108
**since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for inoperable sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @ 95% (α=0.05) for inoperable samples
Correlation co-efficient r = 0.799
p value for correlation co-efficient = 0.003
∴ correlation is significant

Prince George District: INOPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Prince George District: **Inventory Classification Assessment**

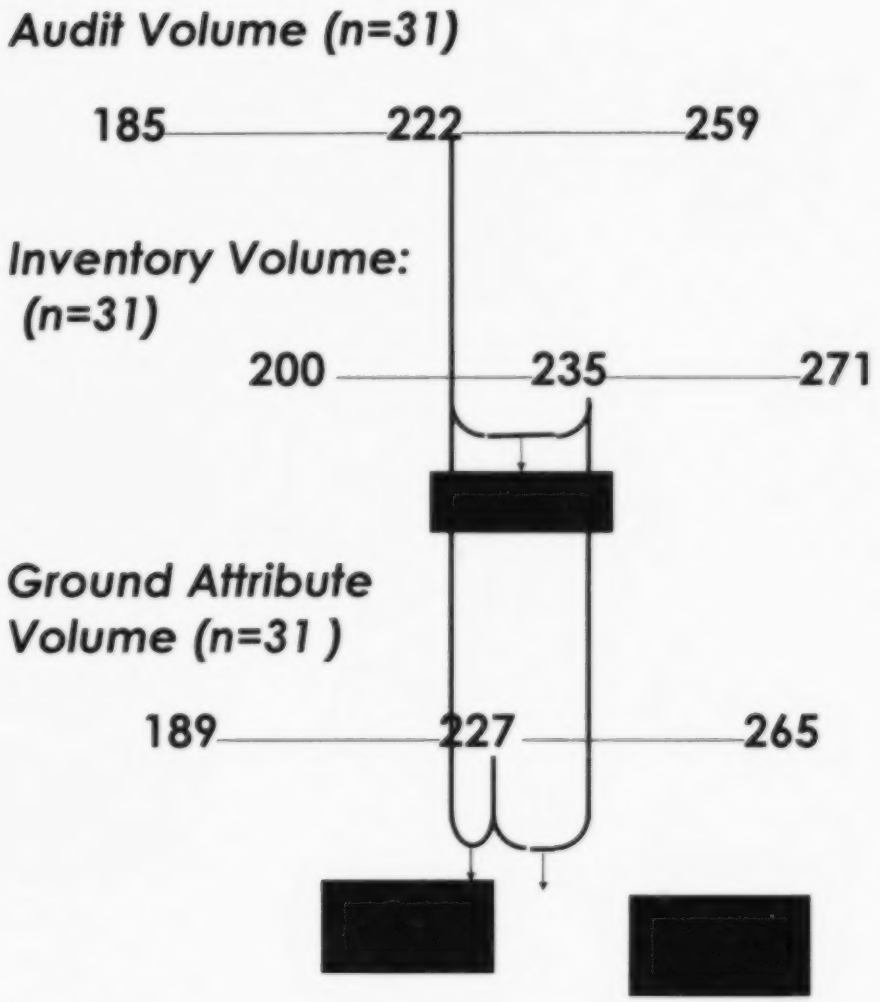
- **51%** of the growth type groups from the inventory (ie. map labels) matched the audit growth type groups.
- the growth type group distribution for the 51 inventory audit samples is as follows (the bold italic entries on the diagonal in the table indicate a GTG match between the audit and the inventory):

Audit GTG	***Inventory GTG (columns)***										
(rows)	G	H	I	J	K	L	M	N	O	P	*total*
G	***0***	0	0	1	0	0	0	0	0	0	1
H	0	***7***	1	3	0	0	0	0	0	0	11
I	0	0	***1***	4	0	0	0	0	0	0	5
J	0	1	4	***7***	0	0	1	0	0	0	13
K	0	0	1	0	***0***	0	2	0	0	0	3
L	0	0	0	0	0	***6***	1	1	0	0	8
M	0	0	0	1	0	0	***4***	1	0	0	6
N	0	0	0	0	0	0	0	***0***	0	0	0
O	0	0	0	0	0	0	0	0	***0***	2	2
P	0	0	0	0	0	0	0	0	1	***1***	2
total	0	8	7	16	0	6	8	2	1	3	**51**

Letter symbols correspond to GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District*



* These results represent the unweighted mean of the samples that fell within the Vanderhoof District of the Prince George TSA.

Vanderhoof District

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=31)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

185 ——— 222 ——— 259 Audit Volume (16.7% sampling error)

200 ——— 235 ——— 271 Inventory Volume (map label attributes predicted in VDYP) (14.9% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.94$

1.0
↓

0.81 ——— 0.94 ——— 1.08

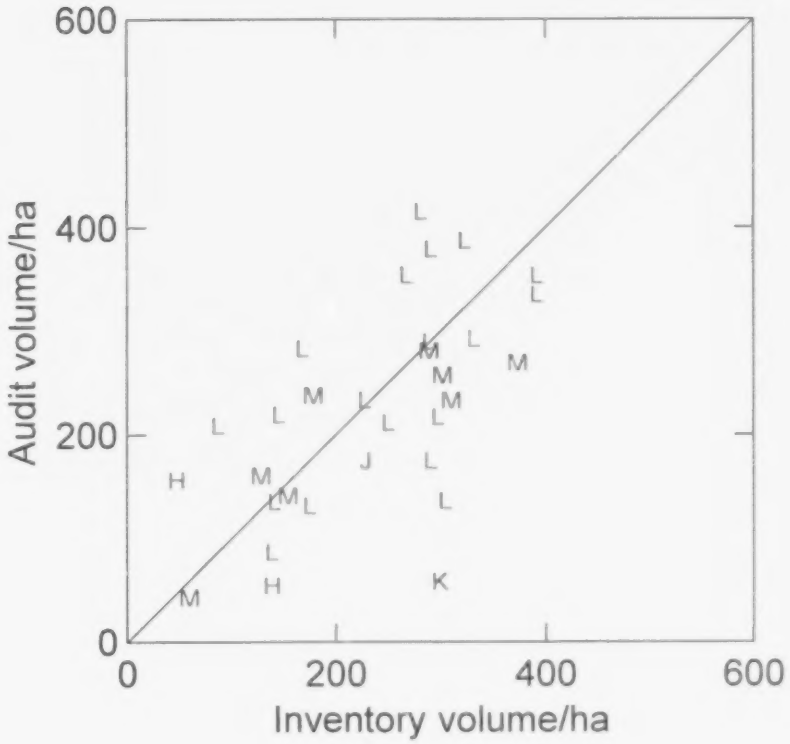
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume.*

3. Paired T Test @ 95% (α=0.05) for all sample polygons
mean difference = -12.994 m^3/ha
p - value for mean difference = 0.415
**since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @ 95% (α=0.05) for all samples
Correlation co-efficient r = 0.906
p value for correlation co-efficient < 0.001
∴ correlation is significant

Vanderhoof District
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=31)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2))*

185——————**222**——————**259** Audit Volume (16.7% sampling error)

189——————**227**——————**265** Ground Attribute Volume (predicted in VDYP) (16.8% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 0.98$$

1.0
↓

0.92——————**0.98**——————**1.04**

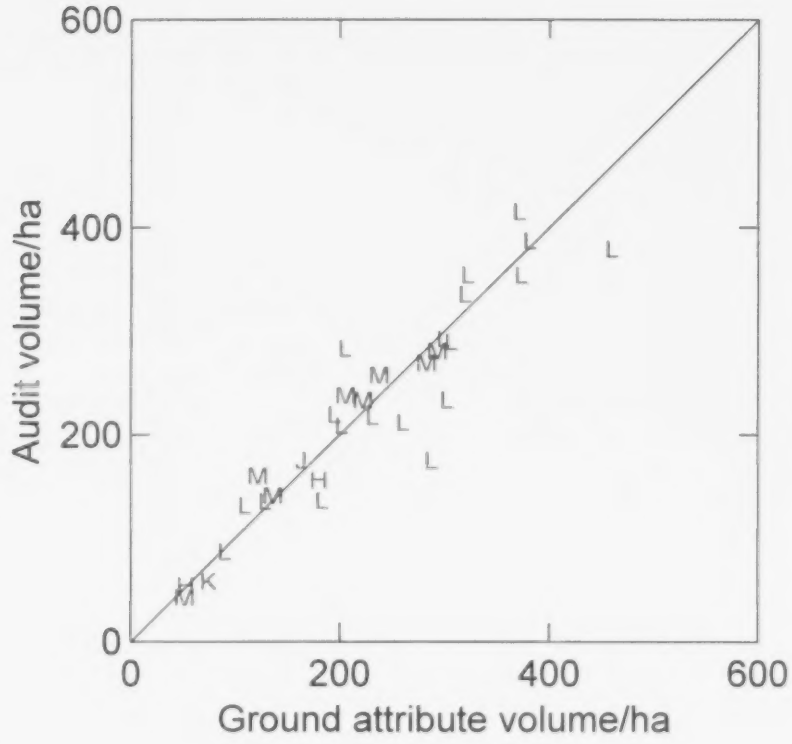
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the ground attribute volume.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -4.99 m^3/ha
p - value for mean difference = 0.472
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.931
p - value for correlation co-efficient < 0.001
∴ correlation is significant

VANDERHOOF District
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=31)

1. Average volumes/ha and confidence interval @ 95%
(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

189——227——265

Ground Attribute Volume
(predicted in VDYP)
(16.8% sampling error)

200——235——271

Inventory Volume
(map label attributes predicted in VDYP)
(14.9% sampling error)

2. Ratio Analysis : Ratio of Means @ 95%

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 0.97$$

1.0
↓
0.84——0.97——1.09

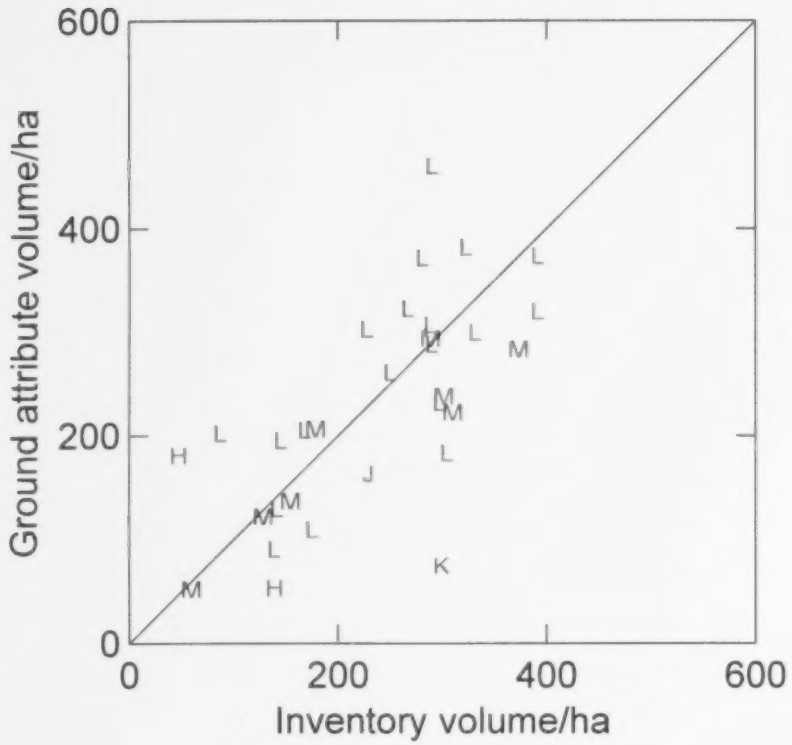
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -8.003 m^3/ha
p - value for mean difference = 0.587
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.673
p - value for correlation co-efficient < 0.001
∴ correlation is significant

VANDERHOOF District
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District

Audit (ground measured) top height vs. Inventory Height (n=31)

1. Average height (m) and confidence interval @ 95%

19.4——21.0——22.5 Audit (ground measured) height (7.4% sampling error)

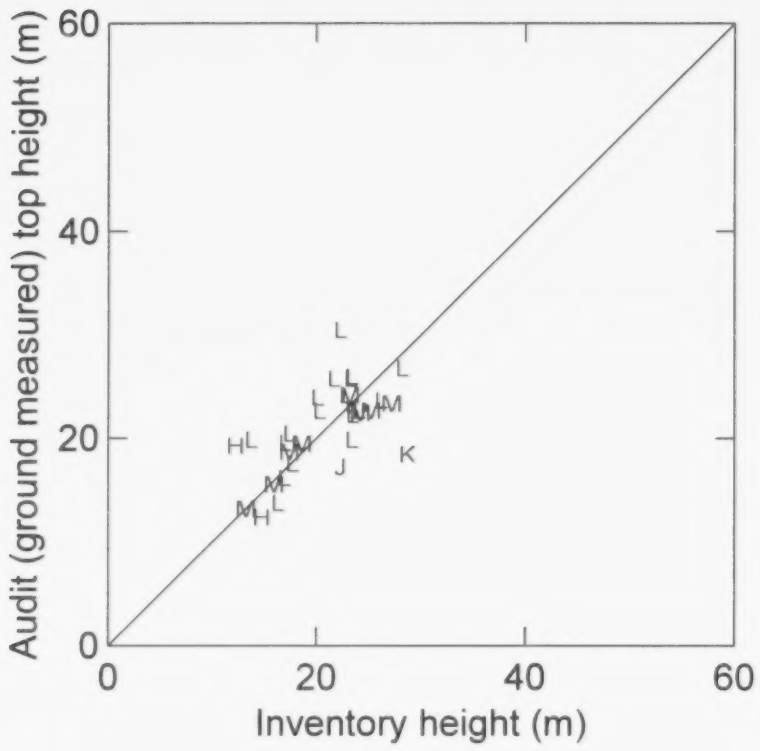
19.1——20.8——22.5 Inventory height (8.0% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = 0.155 m
p - value for mean difference = 0.818
**since p - value > α, the difference is not significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were no significant differences within any of the GTGs.

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.641
p - value for correlation co-efficient < 0.001
∴ correlation is significant

VANDERHOOF District
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District

Audit (ground measured) age of top height trees vs. Inventory age (n=31)

1. Average age (years) and confidence interval @ 95%

103——**119**——**134** Audit (ground measured) age (13.0% sampling error)

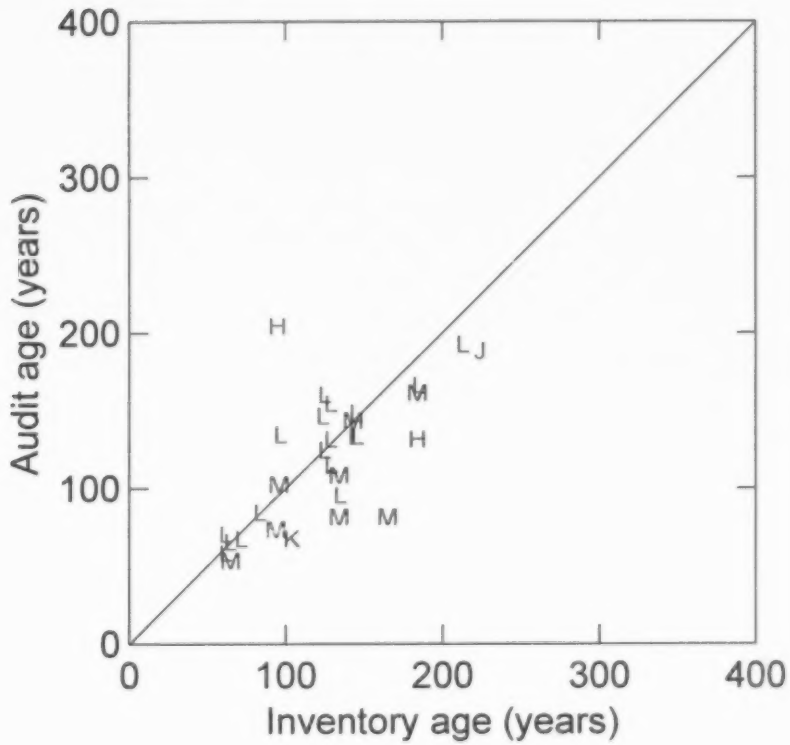
110——**127**——**142** Inventory age (12.4% sampling error)

2. Paired T Test @ 95% (α = 0.05) for all sample polygons
mean difference = -7.774 years
p - value for mean difference = 0.209
**since p - value > α, the difference is not significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTG M.
for GTG M: mean difference = -26.6 years; p-value=0.037; n=8)

4. Correlation @95%(α = 0.05) for all samples
Correlation co-efficient r = 0.685
p - value for correlation co-efficient < 0.001
.: correlation is significant

VANDERHOOF District
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District: OPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=27)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

191 ——— 231 ——— 271 Audit Volume (17.1% sampling error)

217 ——— 252 ——— 286 Inventory Volume (map label attributes predicted in VDYP) (13.7% sampling error)

2. Ratio Analysis : Ratio of Means @95% for operable samples

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.92$

1.0 ↓

0.79 ——— 0.92 ——— 1.05

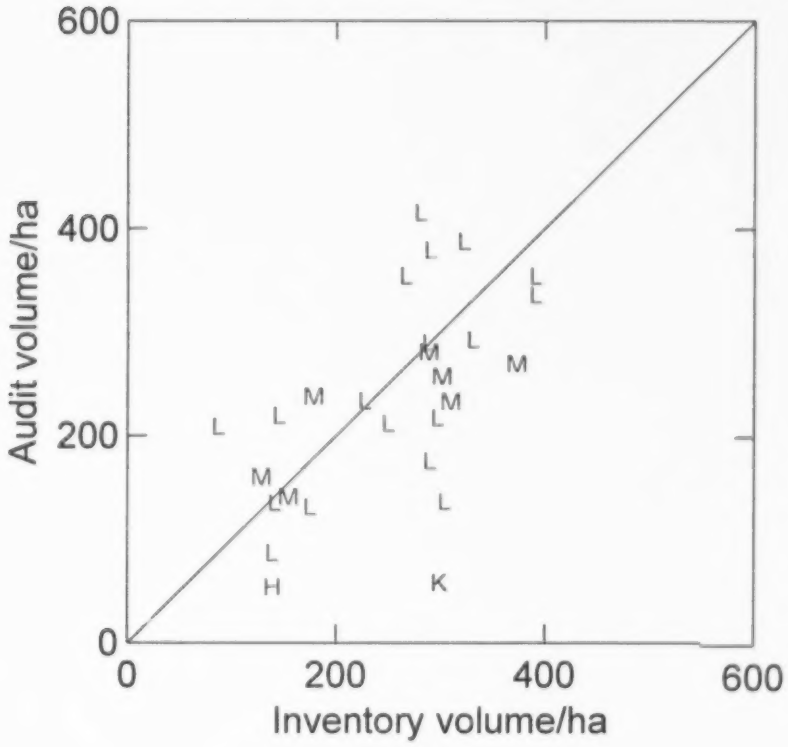
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume for the operable samples.*

3. Paired T Test @ 95% (α=0.05) for operable samples
   mean difference = -20.515 m^3/ha
   p - value for mean difference = 0.230
   **since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for operable samples by map label GTG
   There were no significant differences within any of the GTGs.

5. Correlation @ 95% (α=0.05) for operable samples
   Correlation co-efficient r = 0.579
   p value for correlation co-efficient = 0.002
   ∴ correlation is significant

Vanderhoof District: OPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Vanderhoof District: INOPERABLE SAMPLES

Results not summarized here because of small sample size (n=4) and high variability.

Vanderhoof District: Inventory Classification Assessment

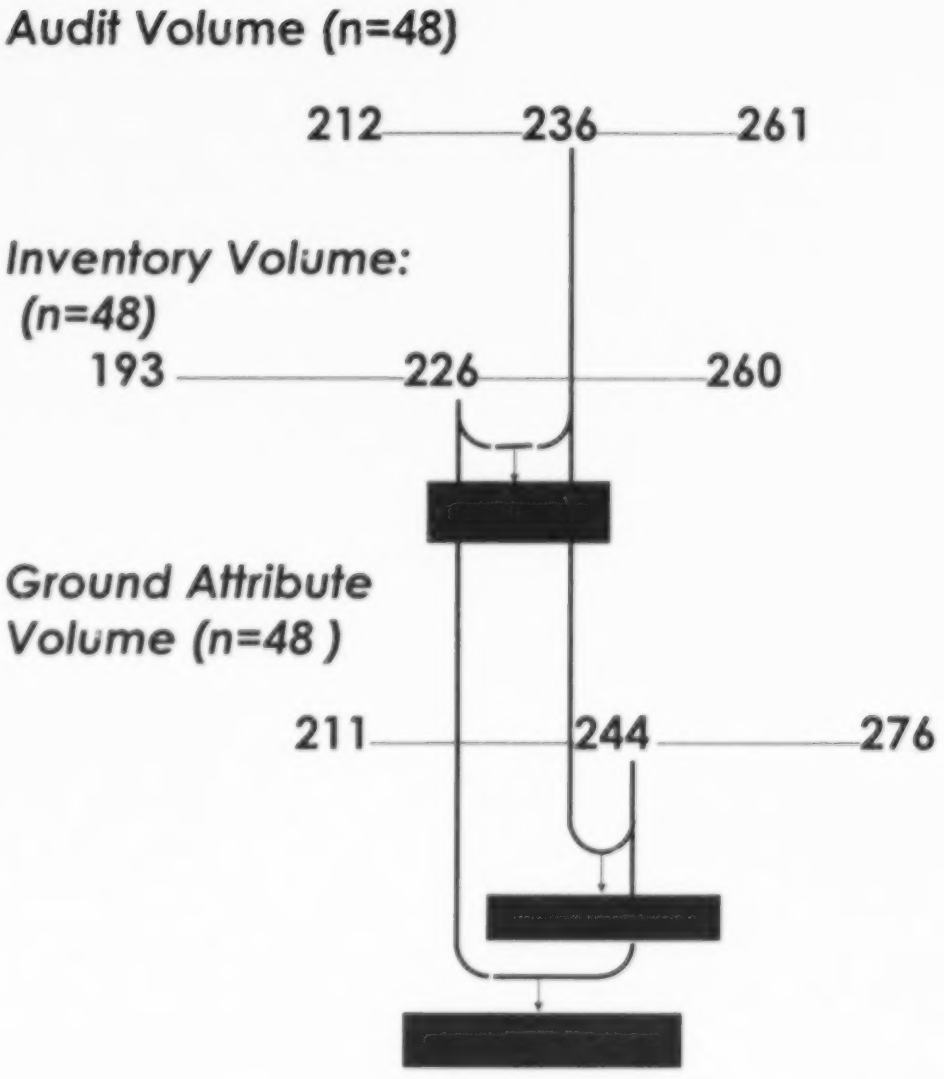
- **55%** of the growth type groups from the inventory (ie. map labels) matched the audit growth type groups.
- the growth type group distribution for the 31 inventory audit samples is as follows (the bold italic entries on the diagonal in the table indicate a GTG match between the audit and the inventory):

Audit GTG	***Inventory GTG (columns)***										
(rows)	G	H	I	J	K	L	M	N	O	P	*total*
G	***0***	0	0	0	0	0	0	0	0	0	0
H	0	***2***	0	1	0	0	0	0	0	0	3
I	0	0	***0***	0	0	0	0	0	0	0	0
J	0	0	0	***0***	0	0	0	0	0	0	0
K	0	0	0	0	***0***	0	3	0	0	0	3
L	0	0	0	0	0	***12***	1	0	0	0	13
M	0	0	0	0	0	7	***3***	0	0	0	10
N	0	0	0	0	0	0	1	***0***	0	0	1
O	0	0	0	0	0	0	0	0	***0***	0	0
P	0	0	0	0	1	0	0	0	0	***0***	1
total	0	2	0	1	1	19	8	0	0	0	**31**

Letter symbols correspond to GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

*Fort St. James District**



* These results represent the unweighted mean of the samples that fell within the Fort St. James District of the Prince George TSA.

Fort St. James District

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=48)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

212 —— 236 —— 261 Audit Volume (10.4% sampling error)

193 —— 226 —— 260 Inventory Volume (map label attributes predicted in VDYP) (14.9% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 1.04$$

1.0 ↓

0.92 —— 1.04 —— 1.17

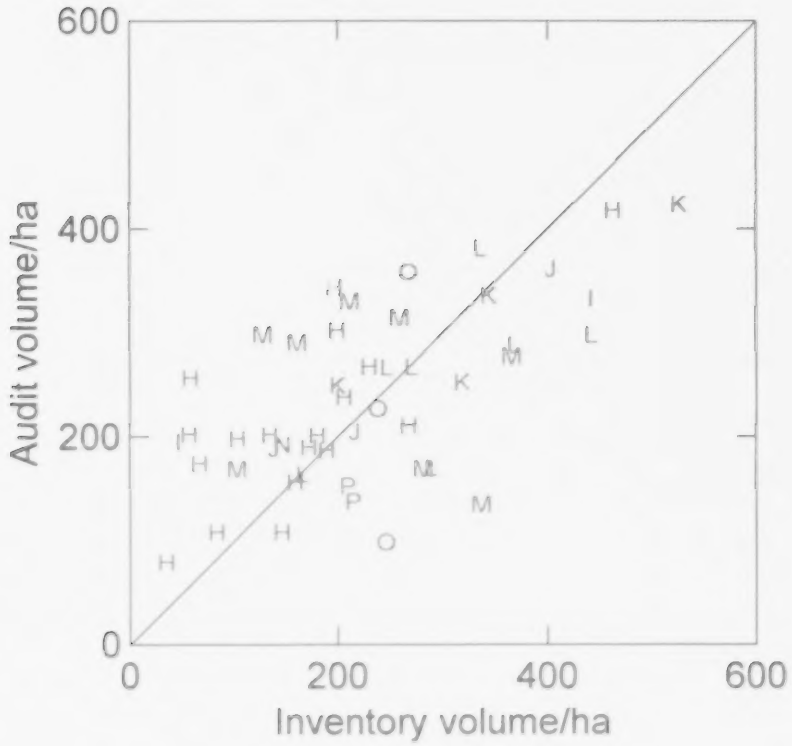
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume.*

3. Paired T Test @ 95% (α=0.05) for all sample polygons
mean difference = 10.173 m^3/ha
p - value for mean difference = 0.445
**since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There was a significant difference within GTG H.
(for GTG H: mean difference = 49.089 m^3/ha; p-value=0.009; n=18)

5. Correlation @ 95% (α=0.05) for all samples
Correlation co-efficient r = 0.625
p value for correlation co-efficient < 0.001
∴ correlation is significant

Fort St. James District
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl., S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Fort St. James District

Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP): "VDYP model" bias (n=48)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only /Tree class 1,2)]*

212——236——261 Audit Volume (10.4% sampling error)

211——244——276 Ground Attribute Volume (predicted in VDYP) (13.3% sampling error)

2. Ratio Analysis : Ratio of Means @95%

$$R = \frac{\text{average audit volume}}{\text{average ground attribute volume predicted in VDYP}} = 0.97$$

1.0 ↓

0.87——0.97——1.07

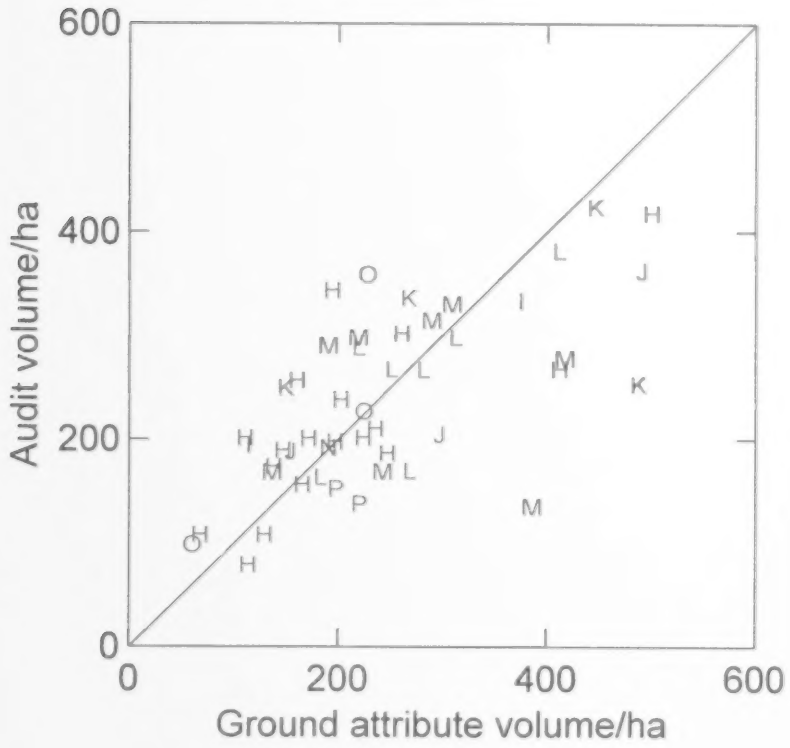
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the ground attribute volume.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -7.16 m^3/ha
p - value for mean difference = 0.560
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.662
p - value for correlation co-efficient < 0.001
∴ correlation is significant

FORT ST. JAMES District
Audit Volume (Kozak) vs. Ground Attribute Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid*

Fort St. James District

Ground Attribute Volume (predicted in VDYP) vs. Inventory Volume (predicted in VDYP): "Attribute" Bias (n=48)

1. Average volumes/ha and confidence interval @ 95%
(Utilization level : 12.5 cm + net merch. less decay only, Tree Class 1,2))

211——244——276 Ground Attribute Volume (predicted in VDYP) (13.3% sampling error)

193——226——260 Inventory Volume (map label attributes predicted in VDYP) (14.9% sampling error)

2. Ratio Analysis : Ratio of Means @ 95%

$$R = \frac{\text{average ground attribute volume (VDYP)}}{\text{average inventory volume (VDYP)}} = 1.08$$

1.0 ↓

0.97——1.08——1.18

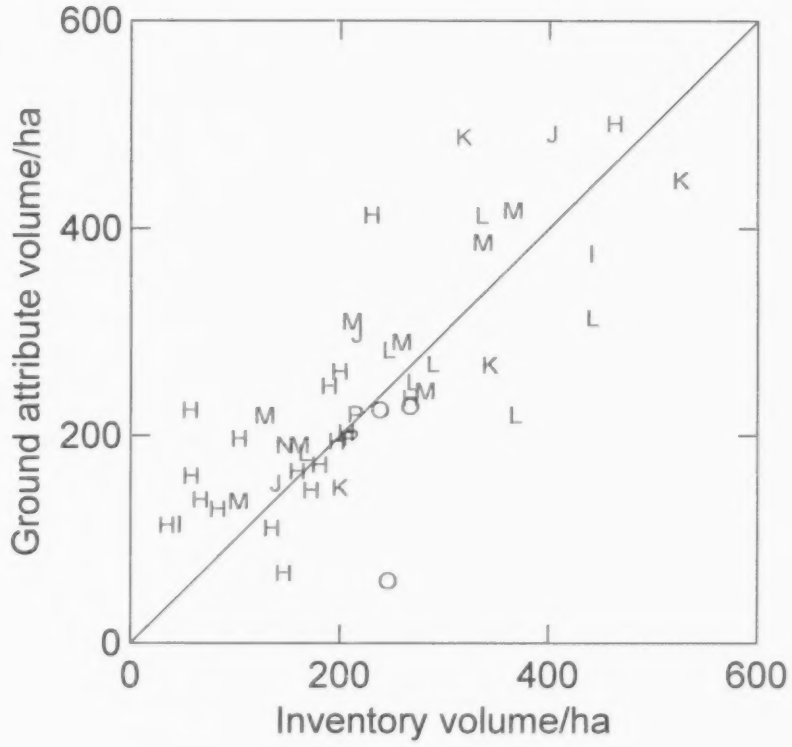
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the ground attribute volume predicted in VDYP and the inventory volume predicted in VDYP.*

3. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = 17.333 m^3/ha
p - value for mean difference = 0.124
**since p - value > α, the difference is not significant*

4. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTGs H and M.
(for GTG H: mean difference = 40.383 m^3/ha; p-value=0.024; n=18
for GTG M: mean difference = 43.113 m^3/ha; p-value=0.024; n=8)

5. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.774
p - value for correlation co-efficient < 0.001
.: correlation is significant

FORT ST. JAMES District
Ground Attribute Volume (Predicted in VDYP) vs. Inventory Volume (Predicted in VDYP) by GTG
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Fort St. James District

Audit (ground measured) top height vs. Inventory Height (n=48)

1. Average height (m) and confidence interval @ 95%

20.7——22.4——24.1 Audit (ground measured) height (7.6% sampling error)

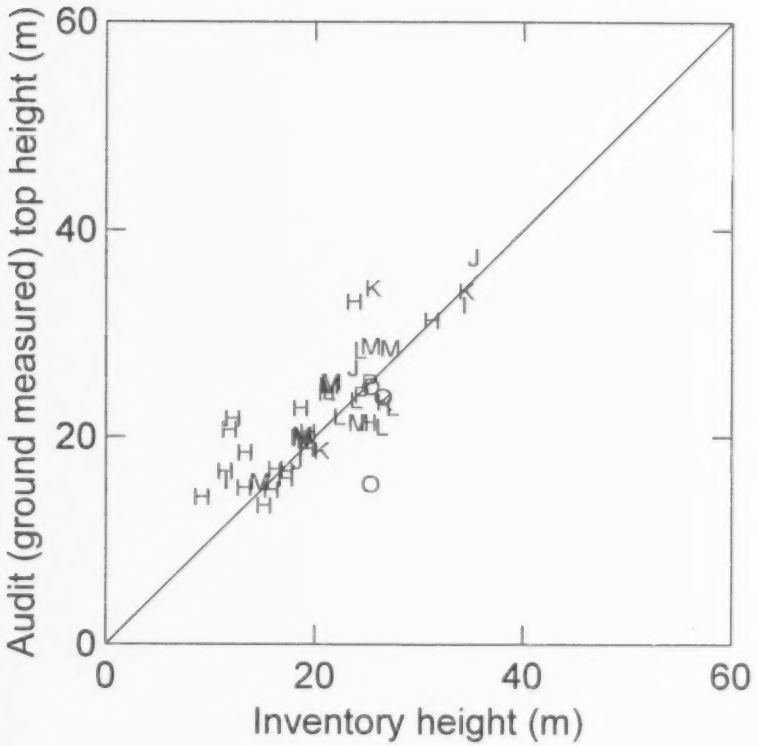
19.5——21.3——23.1 Inventory height (8.4% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = 1.083 m
p - value for mean difference = 0.056
**since p - value > α, the difference is not significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTG H.
(for GTG H: mean difference = 2.483 m; p-value=0.018; n=18)

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.798
p - value for correlation co-efficient < 0.001
.: correlation is significant

FORT ST. JAMES District
Audit Height vs. Inventory Height (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Fort St. James District

Audit (ground measured) age of top height trees vs. Inventory age (n=48)

1. Average age (years) and confidence interval @ 95%

116——**128**——**141** Audit (ground measured) age (9.5% sampling error)

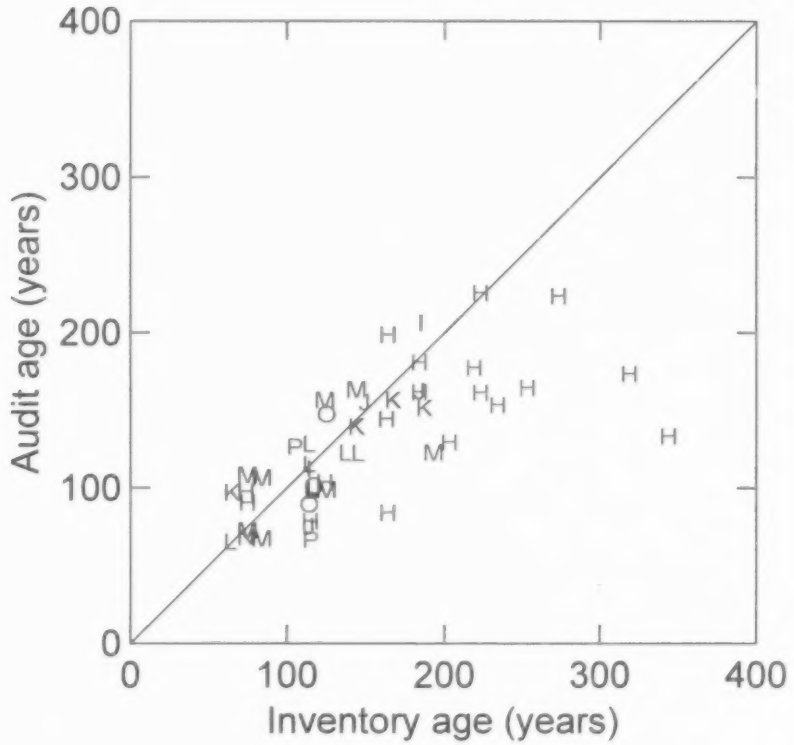
131——**150**——**169** Inventory age (12.5% sampling error)

2. Paired T Test @ 95% ($\alpha = 0.05$) for all sample polygons
mean difference = -21.673 years
p - value for mean difference = 0.002
**since p - value < α, the difference is significant*

3. Paired T Test @ 95% for all sample polygons by map label GTG
There were significant differences within GTG H.
for GTG H: mean difference = -48 years; p-value=0.004; n=18)

4. Correlation @95%($\alpha = 0.05$) for all samples
Correlation co-efficient r = 0.692
p - value for correlation co-efficient < 0.001
∴ correlation is significant

FORT ST. JAMES District
Audit Age vs. Inventory Age (by GTG)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Fort St. James District: OPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=31)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

233 ——— 262 ——— 291 Audit Volume (10.9% sampling error)

230 ——— 271 ——— 311 Inventory Volume (map label attributes predicted in VDYP) (14.9% sampling error)

2. Ratio Analysis : Ratio of Means @95% for operable samples

$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 0.97$

1.0 ↓

0.86 ——— 0.97 ——— 1.08

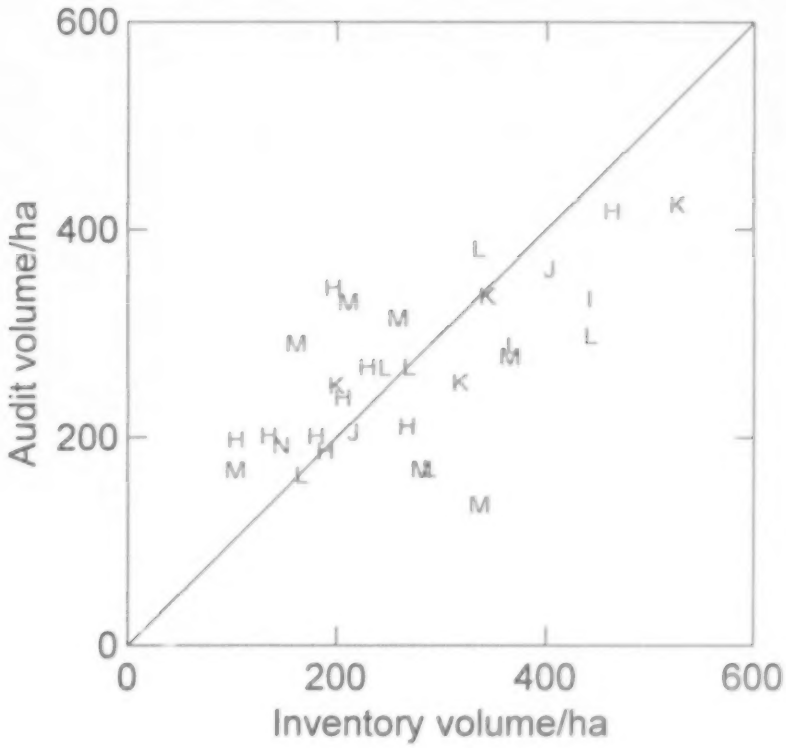
** Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume for the operable samples.*

3. Paired T Test @ 95% (α=0.05) for operable samples
mean difference = -8.768 m^3/ha
p - value for mean difference = 0.570
**since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for operable samples by map label GTG
There were no significant differences within any of the GTGs.

5. Correlation @ 95% (α=0.05) for operable samples
Correlation co-efficient r = 0.640
p value for correlation co-efficient < 0.001
.: correlation is significant

Fort St. James District: OPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Fort St. James District: INOPERABLE SAMPLES

Audit Volume (Kozak) vs. Inventory Volume (Predicted in VDYP) (n=17)

1. Average Volumes/ha and Confidence Interval @ 95% *(Utilization level : 12.5 cm + net merch. less decay only/Tree Class 1,2)*

149 ——— 190 ——— 230 Audit Volume
(21.3% sampling error)

105 ——— 145 ——— 184 Inventory Volume
(map label attributes predicted in VDYP)
(27.2% sampling error)

2. Ratio Analysis : Ratio of Means @95% for inoperable samples

$$R = \frac{\text{average audit volume}}{\text{average inventory volume}} = 1.31$$

1.0
↓

0.91 ——— 1.31 ——— 1.70

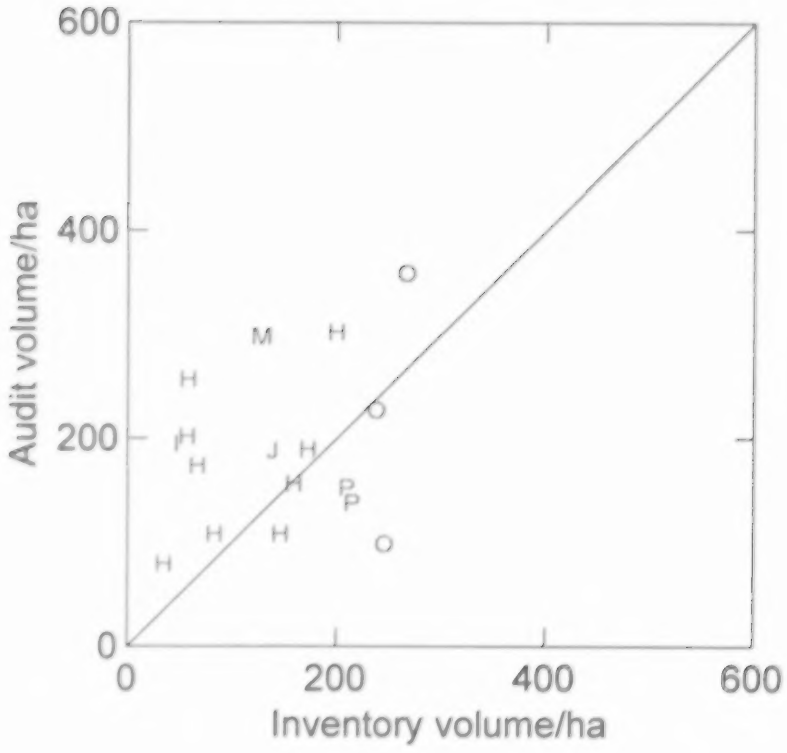
* *Since 1.0 is within the interval, the ratio indicates that there is no significant difference between the audit volume and the inventory volume for the inoperable samples.*

3. Paired T Test @ 95% (α=0.05) for inoperable samples
mean difference = 44.712 m^3/ha
p - value for mean difference = 0.071
**since p-value > α, the difference is not significant*

4. Paired T Test @ 95% for inoperable samples by map label GTG
There were significant differences within GTGs H and M.
(for GTG H: mean difference = 66.111 m^3/ha; p-value=0.032; n=9)

5. Correlation @ 95% (α=0.05) for inoperable samples
Correlation co-efficient r = 0.247
p value for correlation co-efficient = 0.340
∴ correlation is NOT significant

Fort St. James District: OPERABLE
Audit Volume vs. Inventory Volume (by GTG)
(Tree Class 1 & 2, less decay only, 12.5cm + dbh)



Letter symbols correspond to map label GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*

Fort St. James District: **Inventory Classification Assessment**

- **48%** of the growth type groups from the inventory (ie. map labels) matched the audit growth type groups.
- the growth type group distribution for the 48 inventory audit samples is as follows (the bold italic entries on the diagonal in the table indicate a GTG match between the audit and the inventory):

Audit GTG	***Inventory GTG (columns)***										
(rows)	G	H	I	J	K	L	M	N	O	P	*total*
G	***0***	1	0	0	0	0	0	0	0	0	1
H	0	***13***	0	1	1	0	1	0	0	0	16
I	0	0	***1***	0	0	0	0	0	0	0	1
J	0	3	1	***0***	1	0	0	0	1	0	6
K	0	1	0	2	***2***	0	1	0	0	0	6
L	0	0	0	0	0	***2***	1	1	0	0	4
M	0	0	0	0	0	5	***5***	0	0	0	10
N	0	0	0	0	0	0	0	***0***	0	0	0
O	0	0	0	0	0	0	0	0	***1***	1	2
P	0	0	0	0	0	0	0	0	1	***1***	2
total	0	18	2	3	4	7	8	1	3	2	**48**

Letter symbols correspond to GTG's as follows:

G	*HF,HL,HPy,HPw,HPl,HC,HB,HS*	L	*pure Pl or Pa*
H	*B, BH, BS,BF,BPw,BPl,BL,BPy,BDecid.*	M	*Pl F, Pl Py,Pl L,Pl Pw,Pl S,Pl B,Pl H,PlC*
I	*pure S*	N	*Pl Decid.*
J	*SF,SL,SPw,SPy,SH,SC,SB,SPl*	O	*Dconif., AtConif*
K	*S Pl , S Decid.*	P	*Dr Decid, Mb, E, At Decid.*